USDA	United States Department of Agriculture	Forest Service	Cherokee National Forest Unaka Ranger District 4900 Asheville Hwy Greeneville, Tennessee 37743	423-638-4109 (Voice) 423-638-6599 (Fax)

Environmental Assessment

Paint Creek Project

Unaka Ranger District
Cherokee National Forest
Greene County, Tennessee

June 26, 2015

Responsible Official: Leslie Morgan, Unaka District Ranger

For Information Contact: Leslie Morgan, Unaka District Ranger
Cherokee National Forest
Unaka Ranger District
4900 Asheville Hwy, SR70
Greeneville, TN 37743
(423) 638-4109

Document Structure

The Forest Service has prepared this Environmental Assessment (EA) in compliance with the National Environmental Policy Act (NEPA) and other relevant Federal and State laws and regulations. The EA discloses the direct, indirect, and cumulative environmental impacts that would result from the proposed action and alternatives. The document is organized into six parts:

- Chapter 1: Purpose and Need - The section includes information on the history of the project proposal, the purpose of and need for the project and the agency's proposal for addressing the purpose and need. This section also details how the Forest Service informed the public of the proposal and how the public responded.

- Chapter 2: Alternatives considered, including the Proposed Action - This section provides a more detailed description of the agency's proposed action as well as alternative methods for achieving the stated purpose and need. The alternatives were developed based on issues raised by the public, other agencies and Forest Service personnel. Finally, Chapter 2 provides a summary table of each alternative's proposed actions.

- Chapter 3: Affected Environment and Environmental Consequences - This section examines the existing conditions in the project area and provides professional analyses of potential impacts of implementing the alternatives described in Chapter 2. The analyses are organized by Resource Area. For each analysis, effects of the No-Action Alternative are discussed first to provide a baseline for evaluation and comparison with other alternatives. The following resources are analyzed in Chapter 3 include: Soil and Water, Forest Resources, Health and Safety, Biological Resources, Scenery Resources, Recreation Resources, Cultural Resources, Climate Change, and Economics.

- Chapter 4: Literature Cited - This section provides a list of those documents specifically cited in the preparation of this assessment.

- Chapter 5: List of Preparers - This section provides a list of individuals who assisted in the development of the environmental assessment.

- Appendices - Appendices provide more detailed information presented in the environmental assessment.

Additional documentation may be found in the project planning record located at the Unaka District Office in Greeneville, Tennessee.

Table of Contents

Glossary, Acronyms and Abbreviations

36 CFR 800	Regulations implementing Section 106 of the National Historic Preservation Act, as amended
Acre (ac.)	A unit of land area equal to 43,560 ft^2 (208.7 ft x 208.7 ft)
Acid Equivalent (a.e.)	The portion of a formulation that theoretically could be converted back to the corresponding or parent acid.
Alternative (Alt)	A mix of resource outputs designed to achieve a desired management emphasis as expressed in goals and objectives, and in response to public issues or management concerns.
AT (A.T.)	Appalachian Trail
Basal Area (BA)	The area of a given section of land that is occupied by the cross-section of tree trunks and stems at their base. Units = ft^2/acre.
Biodiversity	The diversity of life in all its forms and all its levels of organization.
Biological Evaluation (BE)	A documented Forest Service review of its activities in sufficient detail to determine how an action may affect any proposed, threatened, endangered, or sensitive species.
Biomass	The total mass of living matter within a given unit of environmental area.
BMP	Best Management Practices
Breeding Habitat	A large area of essential habitat that provides for the biological needs of the species within its breeding range.
CCF	Hundred cubic feet of timber. 1 standard cord = 0.79 CCF.
CEQ (CEQ Regulations)	Council of Environmental Quality, established by the National Environmental Policy Act of 1969, for regulating how NEPA is to be implemented. The Council is part of the Executive Branch of Federal Government.
CFR	Code of Federal Regulations
CNF	Cherokee National Forest
Compartment	A portion of a forest usually one ownership, usually contiguous and composed of a variety of forest stand types, defined for purposes of location reference and as a basis for forest management. (The percentage of land owned by the U. S. Forest Service within any one compartment may vary from <1% to 100%).
Cultural Resource	Physical remains of districts, sites, structures, buildings, networks or objects used by humans in the past. They may be historic, prehistoric, archaeological, architectural, or spiritual in nature. Cultural resources are non-renewable.
Cumulative Effects	Past, present, and reasonably foreseeable effects (regardless of who or what has caused, is causing, and might cause these effects) analyzed together with the effects from the management actions.
Cx/Sy	Compartment x/Stand y (e.g. C100/S10)
Decision maker	Forest Supervisor or District Ranger
Decision Notice (DN)	The decision to implement or not implement an alternative for an Environmental Assessment is recorded in a Decision Notice.
Desired Condition	Description of land and resource conditions if all long-term goals are achieved.

DFC	Desired Future Condition (a.k.a. Desired Condition)
EA	Environmental Assessment
Early-successional Forest (ESF)	The biotic community that develops immediately following the removal or mortality of most or all the forest canopy, resulting in a predominance of woody species regeneration. As used in Land Management Planning, a stand age of 0 to 10 years defines this condition. Often referred to as Early-successional Habitat (see below).
Early-successional Habitat (ESH)	A vegetative condition typically characterized by low density to no tree canopy cover and an abundance of herbaceous and/or woody ground cover. This condition may include early-successional forest, maintained openings, pastures, balds, and open woodlands.
Ecosystem	All the interacting populations of plants, animals, and microorganisms occupying an area, plus their physical environment.
Effective treatment	An activity resulting in a full benefit at year 1, then declining linearly over time until there are minimal benefits. Varies depending on activity.
EHWA (a.k.a. HWA)	Eastern Hemlock Wooly Adelgid
EHWPF	Eastern Hemlock and White Pine Forest
EPA	Environmental Protection Agency
Erosion	The wearing away of the land's surface by running water, wind, ice, other geological agents, and human activity.
ESA	Endangered Species Act of 1973, as amended
Even-aged	The condition of a forest or stand composed of trees having no or relatively small differences in age.
FEIS	Final Environmental Impact Statement for the Cherokee National Forest' *Revised Land and Resource Management Plan* (USDA Forest Service 2004b).
Finding of No Significant Impact (FONSI)	A document that records the decision maker's conclusion that implementing an alternative would have no significant impact on the quality of the human environment, as defined in CEQ Regulations 1508.14.
Forest Plan	Short for the Cherokee National Forest' *Revised Land and Resource Management Plan* (USDA Forest Service 2004a).
FSR (a.k.a. NFSR)	Forest Service Road
GIS	Geographic Information System
Group Selection	An uneven-aged regeneration method in which trees are removed periodically in small groups, resulting in uneven age classes for trees established in the group.
Guideline	Preferable limit to management actions that may be followed to achieve desired conditions.
HESH	High Elevation Shrubby Habitat
Interdisciplinary Team (IDT)	A group of resource specialists who conducted the environmental analysis and who wrote this Environmental Assessment.
Issue	An environmental resource about which someone has a concern. *Issues* are identified in NEPA § 102(2) (E) as *unresolved conflicts*.
Land Class Code (LC)	The fitness of a given type of land for a defined use.

Large Woody Debris (LWD)	Any piece(s) of dead woody material, e.g. dead boles, limbs and large root masses (wads), on the ground in forest stands, or in rivers and streams.
Late Successional Forest (LSF)	The stage of forest development at which overstory trees have attained most of expected height growth and have reached ecological maturity. As used in the RLRMP, a stand age of greater than 80 years defines this condition.
LSOG	Late-successional and Old Growth
Management Indicator Species (MIS)	An animal or plant selected for use as a planning tool in accordance with 1982 NFMA regulations (36 CFR 219.19). These species are used to help set objectives, analyze effects of alternatives, and monitor plan implementation. They are chosen because their population changes are believed to indicate the effects of management on selected biological components.
Management Prescription Area (MPA)	Management practices and intensity selected and scheduled for application on a specific area to attain multiple-use and other goals and objectives. MPAs are defined in the RLRMP
MCF	Thousand Cubic Feet
MDF	Mesic Deciduous Forest
Mid-successional Forest (MSF)	The stage of forest development during which distinct overstory, midstory, and understory canopies are developed. As used in the RLRMP, a stand age of 41 to 80 years defines this condition.
Mitigation Measure	Actions to avoid, minimize, reduce, eliminate or rectify the impact of a management practice (a.k.a. design criteria).
Monitoring Report	The annual CNF Monitoring and Evaluation Report
National Environmental Policy Act (NEPA)	A public law that outlines specific procedures for integrating environmental considerations into agency planning, and requires analyzing possible environmental effects of any major action on public land, and the disclosure of the possible effects to the public and other agencies for review and comment.
Natural Regeneration	Tree seedlings that become established without artificial efforts.
NCT	No Conclusive Trend
NFMA	National Forest Management Act (36 CFR 219.27)
NFSR	National Forest Service Road (a.k.a. FSR)
NHPA	National Historic Preservation Act (Public Law 102-575, 16 U.S.C. 470)
NNIS	Non-Native Invasive Species. Typically applied to non-native plants.
No Action Alternative	The most likely condition expected to exist in the future if current management direction continues unchanged; actions would be deferred; used at the baseline in evaluating possible effects of implementing the action alternatives.
NRHP	National Register of Historic Places
Objective	Concise, time-specific statement of measurable and planned results that respond to identified desired conditions; forms the basis for further planning; and are action items oriented and specifically describe measurable results.
OOPF	Oak and Oak-Pine Forest
OR	“Old” Road; an unauthorized road.

OUT	"Outlaw" Road; an unauthorized road
pH	A measure of acidity
Plantation	An area planted to trees, typically with a planting machine or by hand planting.
PNV	Present Net Value
PO	Permanent Opening
Preferred Alternative	The alternative (option/plan) that the decision maker plans to select near the end of the analysis process. This is not necessarily the selected alternative.
Prescribed fire	Deliberately ignited fire for the purpose of forest management, often to remove a heavy fuel buildup or simulate natural cycles of fire in an ecosystem.
Prescription Area (PA)	Portion of a landscape with similar management objectives and a common management prescription; prescription areas have specific direction regarding their desired condition, objectives, and Standards and Guidelines as provided in the RLRMP. (See also Management Prescription Area.)
Reforestation	To establish trees on a site by natural or artificial means.
Responsible Official	Forest Supervisor or District Ranger
RF	Riparian Forest
RLRMP	Cherokee National Forest *Revised Land and Resource Management Plan* (USDA Forest Service 2004a)
Road Maintenance Level	The established criterion that prescribes the intensity of maintenance necessary for the planning operation of a road. There are five levels from level 1 to level 5, with level 5 requiring the highest intensity of maintenance. See Appendix F of the RLRMP for details on level definitions.
Scenic Integrity Objective (SIO)	SIO guide the amount, degree, intensity, and distribution of management activities needed to achieve desired scenic conditions. Objectives range from very high to very low. See Appendix B in the RLRMP for objective definitions.
SDDW	Snags, Dens and Down Wood
Selected Alternative	The alternative (option/plan) that the decision maker selects to implement.
Self-sustaining	See Species Viability. Populations that are sufficiently abundant and have sufficient diversity to display the array of life history strategies and forms to provide for their long-term persistence and adaptability over time.
Sensitive Species	Plant and animal species identified by the Regional Forester for which population viability is a concern. These species are included in the Eastern Region Sensitive Species list.
Short and Long Term	Generally, short term means the duration of the activity plus a few months. Long term means after the short term, extending out to a specified number of years. Long term (and in some cases, short term) will differ for each resource (e.g. fire, wildlife, recreation, etc.).
Slash	Limbs, branches and tops of trees left after timber harvest.
SMZ	Streamside Management Zone
Snag	A standing dead tree used by wildlife for breeding, roosting, perching and/or foraging purposes.

SPB	Southern Pine Beetle
SPF	Sapling/Pole Forest
Species Viability	A viable species consists of self-sustaining and interacting populations that are well distributed through the species' range.
Stand	A contiguous group of trees sufficiently uniform in species composition, arrangement of age classes, and condition to be a distinguishable unit.
Standard	A requirement found in the RLRMP, which impose limits on natural resource management activities, generally for environmental protection. Standards are required limits to activities.
State Historic Preservation Officer (SHPO)	The official appointed or designated pursuant to section 101(b) (1) of the National Historic Preservation Act to administer the State [Tennessee] historic preservation program or a representative designated to act for the State historic preservation officer.
Stocking density	Density of trees in an area, usually expressed in trees per acre.
Structural Diversity	The diversity in a community that results from having many horizontal or vertical physical elements (e.g. layers of canopy, supercanopy trees, down wood, etc.).
Suitable Habitat	Habitat able to support a reproducing subpopulation of a species.
TDEC	TN Department of Environment and Conservation
TES	Threatened, Endangered and Sensitive species
Trail	An existing one-track path or way of travel.
Treatment	An activity undertaken to modify or maintain the existing condition of the vegetation.
TWRA	TN Wildlife Resource Agency
Unsuitable Habitat	Habitat not able to support a reproducing subpopulation of a species.
USDA	United States Department of Agriculture
USDI	United States Department of Interior
User-created trail	A trail developed by users or use not maintained by the Forest Service.
USFWS	United States Fish and Wildlife Service
VC species	Viability Concern species
Viable Population	A population that has the estimated numbers and distribution of reproductive individuals to ensure the continued existence of the species throughout its range.
Visual Absorption Capability	The physical capability of the land to support management activities and maintain visual integrity.
Visual Quality Objectives (VQOs)	VQO are based on physical and sociological characteristics of an area, and the degree of acceptable alterations of the characteristic landscape. Objectives include Preservation, Retention, Partial Retention, Modification, and Maximum Modification. See Appendix B in the RLRMP for objective definitions.
VMEIS	Vegetation Management Environmental Impact Statement
WLO	Wildlife Opening

Chapter 1: Purpose and Need For Action

As in most of Eastern Tennessee, the Cherokee National Forest (CNF) landscape has been altered by past land management practices. Although National Forests were managed using the best science of the day, some of these past management efforts (or the lack of them) left portions of National Forest System lands in a degraded condition. An awareness of forest health problems and threats facing the nation's forests and grasslands has grown over the years prompting the Forest Service to make ecosystem restoration on a national level one of its highest priorities. Recognizing ecosystem restoration was not being fully met at a landscape scale on the forest, the CNF initiated the Cherokee National Forest Landscape Restoration Initiative (LRI) in 2011.

The LRI was, and continues to be, a group of people from various disciplines, ranging from timber contractors to non-governmental organizations to state and federal employees. Concentrating on the north end of the CNF, the LRI was charged with developing a "…science-based process for supporting the ecological restoration and adaptive management of the native vegetation, rare communities, watersheds and aquatic systems of the CNF" (CNF LRI 2012, p. 7). Once completed, the Forest would, in concert with Forest Plan direction, use the LRI results, along with other best available science, to develop projects which accomplish its management goals and objectives.

The LRI used the LANDFIRE Biophysical Settings model (Bps) to analyze the various ecological systems of the entire north end of the CNF. Data such as successional classes, uncharacteristic vegetation, departure from normal range of natural variability, etc., were generated, mapped, and selected sites ground-truthed. The Bps model's final results revealed those areas of the Forest in need of restoration and areas where restoration was not warranted. The CNF North Zone Interdisciplinary Team used the LRI data, as well as other resource data, on-the-ground knowledge, and Forest Plan direction, to develop the Paint Creek Project.

Information on the Cherokee National Forest Landscape Restoration Initiative can be found at: *www.communityplan.net/cherokee*.

Introduction

The Cherokee National Forest is proposing the Paint Creek Project on the Unaka Ranger District in Greene County, to work toward the desired conditions for the project area, as directed in the CNF *Revised Land and Resource Management Plan* (RLRMP, USDA Forest Service 2004a). The proposed project is subject to the *predecisional objection process* at 36 CFR 218 Subparts A and B, as published in the Federal Register on March 27, 2013.

The Paint Creek Analysis Area (PCAA;) totals approximately 19,911 acres. Table 1a shows the distribution of private and National Forest System lands (NFS) within the PCAA.

Table 1a: Distribution of Lands in the Paint Creek AA

Total Acres[1]	Private (acres)	%	NFS (acres)	%
19,911	3,775	19%	16,136	81%

[1]Acres reported in all tables are approximate.

The RLRMP identifies goals and objectives to be implemented under various management prescriptions. The approximately 16,136 acres of National Forest System lands in the PCAA are distributed among seven management prescriptions, with approximately 299 acres unclassified to a management prescription (Table 1b).

Table 1b: Management Prescriptions in Paint Creek Analysis Area

Prescription	Description	Acres
4.A	Appalachian Trail Corridor	2,327
7.B	Scenic Corridor/Sensitive Viewsheds	2,608
7.D	Concentrated Recreation Zone	48
7.E.2	Dispersed Recreation Areas-Suitable	2,333
8.C	Black Bear Habitat Management	6,982
9.F	Rare Communities	105
12.A	Remote Backcountry Recreation-Few Open Roads	1,434
Unc	Unclassified to Prescription	299
Total Acres		**16,136**

Per the RLRMP, the 7.B, 7.E.2, and 8.C prescriptions are suitable for timber management. Combined, the prescriptions total approximately 11,923 acres, of which 7,204 acres are in a Land Class Code (500s or 600s) with a primary or secondary timber production emphasis (Table 1c).

Table 1c: Acres by Suitable Prescription

Prescription	Total Acres[1]	Suitable Acres	Unsuitable Acres
7.B	2,608	1,102	1,506
7.E.2	2,333	896	1,437
8.C	6,982	5,206	1,776
Total	**11,923**	**7,204**	**4,719**

[1] A mapping error resulted in fewer acres of 8.C and total Prescription acres being reported in the scoping letter. Acres for 7.B and 7.E.2 were/are correct.

The remaining approximately 8,932 acres or 55% of all National Forest System lands within the PCAA are within prescriptions considered unsuitable for timber management (4,213 acres, includes the unclassified NFS lands) or, if in a suitable prescription, are in Land Class Codes without a primary or secondary timber production emphasis (4,719 acres). These acres would continue to be managed per the management prescription direction found within the RLMP.

Bald Mountain Roadless Area

The nearly 23,000-acre Bald Mountain Roadless Area (BMRA) is located in Tennessee (11,744 acres, all on the CNF) and North Carolina (10,971 acres). Approximately 1,444 acres (6%) of the BMRA, all within the 12.A prescription, occurs within the Paint Creek Analysis Area. The PCAA portion of the roadless area consists of mountainous terrain with steep southeast-facing slopes bisected by steep drains which connect to Paint Creek. The approximately 1,200-acre Upper Paint Creek burn block (N22) is located entirely within the roadless area.

Opportunities for dispersed recreation are limited. There are no developed recreation sites within the PCAA portion of the BMRA. The Greene Mountain Trail (#13), designated for hiking, mountain biking, and horse riding, borders the roadless area for approximately 2.5 miles along the ridge of Greene Mountain.

Approximately 2.4 miles of Forest Service System roads (FSR), located primarily in the far eastern section of the roadless area, are within or directly border the BMRA: FSR 120, a closed road, is maintained as an approximately 0.7-mile linear wildlife opening; and FSRs 358 (1.0 miles) and 358A (0.7 miles) are seasonal roads, closed from mid-December to mid-March. Upper Paint Creek Road, a Greene County maintained road (CR 42), borders the roadless area for approximately 0.4 miles along its southeastern edge.

For detailed information on the Bald Mountain Roadless Area (Tennessee portion), see Appendix C, pages 105-113, in the *Final Environmental Impact Statement for the Revised Land and Resource Management Plan, Cherokee National Forest* (USDA Forest Service 2004c).

Proposal

The Paint Creek Project proposes to:

- Provide early-successional forest for wildlife,
- Encourage oak and other mast-producing species,
- Maintain existing roads, reconstruct an existing road, and construct temporary roads,
- Prescribed burn,
- Improve wildlife habitat,
- Decommission roads, and
- Authorize roads.

Goals and Objectives

Forestwide goals and objectives and Management Prescription goals and objectives found in the Cherokee National Forest *Revised Land and Resource Management Plan* (USDA Forest Service 2004a) provide the following direction for the Paint Creek Project's proposed actions (pages 29-33, 38, 42-50, 61-62, 67, 121, 133, 137, and 142):

Forestwide Goals and Objectives

Goal 10 Maintain and restore natural communities in amounts, arrangements, and conditions capable of supporting viable populations of existing native and desired non-native plants, fish, and wildlife species within the planning area.

Goal 14 Contribute to conservation and recovery of federally listed threatened and endangered species, and avoid actions that would lead to federal listing of other species under the Endangered Species Act.

Objective 14.02 Provide upland water sources approximately every 0.5 miles, to provide an important habitat element for wildlife, including the endangered Indiana bat. Water sources are comprised of both permanent ponds and ephemeral pools and are often located in openings or near road corridors that allow access by bats.

Goal 16 Manage through protection, maintenance, or restoration, a variety of large, medium, and small old growth patches to provide biological and social benefits.

Objective 16.01 Map patches, as discovered, of old growth identified during stand examination. Complete field verification of possible existing old growth areas in our current inventory.

Goal 17 Restore and maintain forest communities to those plant communities predicted as most likely to occur based on the ecological potential of the site potential native vegetation.

Objective 17.01 Over the ten-year period restore at least 5000 acres of diverse native communities appropriate to sites currently occupied by white pine plantations.

Objective 17.02 Over the 10-year period restore oak or oak-pine forests on at least 9,000 acres of appropriate sites currently occupied by pine plantations or other sites with minimal diversity.

Objective 17.03 Over the 10-year period, restore at least 10,000 acres of shortleaf/pitch/table-mountain pine forests.

Objective 17.06 Restore at least 5,700 acres in dry and xeric oak and pine-oak forests to open woodlands, savannas, and grasslands over a 10-year period.

Goal 18 Contribute to maintenance or restoration of native tree species whose role in forest ecosystems is threatened by insects and disease. Management activities will reduce the impacts from non-native invasive species.

Objective 18.02 Promote the health of susceptible forest communities by maintaining a site-specific basal area that promotes tree vigor. Encourage advanced regeneration of oak species.

Goal 19 Where forest management activities are needed and appropriate to achieve the desired composition, structure, function, productivity, public health and safety, and sustainability of

forest ecosystems; a result of such activities will also be to provide wood products for local needs.

Objective 19.01 Provide 33,726 MCF of sawtimber per decade.

Objective 19.02 Provide 6,242 MCF of pulpwood per decade.

Goal 21 Use fire during dormant and growing seasons to achieve ecological sustainability, rehabilitation, and restoration of fire dependent and associated communities. Identify and establish appropriate "burning blocks" that facilitate the use of prescribed fire to maintain and restore fire dependent and associated communities.

Goal 40 Conserve, maintain, and enhance the scenic and aesthetic values of the CNF.

Goal 47 Construct, reconstruct and maintain roads to reduce sediment delivery to water bodies.

Goal 48 Provide a transportation system that supplies safe and efficient access for forest users while protecting forest resources. Emphasize acquisition of rights-of-way or fee-simple titles as appropriate to facilitate maintenance and meet access needs.

Goal 49 Decommission unneeded roads.

Objective 49.01 Decommission unneeded roads that are identified through an interdisciplinary process.

Goal 51 Construct new NFSR only where allowed by prescription and where existing roads are inadequate to meet the need.

Management Prescription Objectives and Prescriptions

Prescription 7B-2: This area is suitable for timber management

Objective 7.E.2-1.01 Manage forest successional stages to maintain a minimum of 50 percent of forested acres in mid- to late-successional forest, including old growth; a minimum of 20 percent of forested acres in late-successional forest, including old growth; and 4 to 10 percent in early-successional forest.

Prescription 7.E.2-1: Creation of early-successional forest habitat is limited to 10 percent of forested acres. Existing patches of early-successional forest greater than 2 acres in size are included when calculating allowable levels of early-successional forest creation.

Prescription 7.E.2-2: This area is suitable for timber management.

Objective 8.C-1.01: Strive for a 125-year rotation. Manage forest successional stages to maintain a minimum of 65 percent of forested acres in mid- to late-successional forest, including old growth; a minimum of 20 percent of forested acres in late-successional forest including old growth; and 4 to 8 percent in early-successional forest.

Prescription 8.C-1: Creation of early-successional forest habitat is limited to 8 percent of forested acres. Existing patches of early-successional forest greater than 2 acres in size are included when calculating allowable levels of early-successional forest creation.

Prescription 8C-2: This area is suitable for timber management.

Purpose and Need

The purpose of the Paint Creek Project to work toward the desired condition for the project area as directed in the RLRMP (pages 94-95, 131-133, 135-136, 140-142, and 144-145).

- Past management or, in some cases, the lack of management has allowed forest communities and ecological relationships to develop that are considered atypical for the stand. Tree species diversity in these stands is typically low, especially where dominated by regenerating or immature yellow poplar or white pine, or they are dominated by species/communities uncharacteristic for the site. Per the RLRMP (p. 42), there is a need to move these stands/systems towards plant communities predicted as most likely to occur based on the ecological potential of the site (Forestwide Goals 10 and 17, and Objectives 17.01, 17.02, 17.03 and 17.06).

- A GIS analysis, using 2013 as the base year, identified 169 acres (11 stands) of early-successional forest (ESF; per the RLRMP, stands of 0 to 10 years old) in the project area. However, no ESF has been created via commercial timber harvest in the PCAA within the last ten years, and the GIS calculated ESF acres are in error (J. Stelick, CNF, North Zone, Forester, pers. comm.). Data from past prescribed burning, however, indicates approximately 227 acres of fire-created ESF in the PCAA. These acres are distributed between two prescriptions: 48 acres in 7.B, and 179 acres in 8.C. Based on the most recent year of the prescribed burns, approximately 186 (82%) of the 227 acres is nine years old (again, using 2013 as the base year), 17 acres (7%) is eight years old, and 24 acres (11%) is six years old.

  Prescription areas 7.E.2 and 8.C contain objectives in the RMRMP, for a minimum and maximum percentage of ESF to provide/maintain in these prescriptions. For 7.E.2 the range is 4% to 10%, while for 8.C it's 4% to 8% (Prescription Objectives 7.E.2-1.01 and 8.C-1.01, respectively). According to the distribution of fire-created ESF, there is currently no ESF within the PCAA's 7.E.2 prescription. The approximately 179 acres of ESF in the 8.C prescription is 2% of the prescription's total acres in the PCAA. Per the RLRMP (page 121), prescription 7.B has no specific objective, i.e. no minimum to maximum percent, for early-successional forest. However, the approximately 52 acres of ESF in 7.B is 2% of the prescription's total acres in the PCAA.

  Wildlife species including chestnut-sided warbler, black bear, white-tail deer, ruffed grouse, and wild turkey, utilize this habitat stage. As the availability of early-successional forest habitat declines, so would their populations. Therefore, there is a need to create early-successional forest in the Paint Creek Project area (Prescription Objectives 7.B-2,

7.E.2-1.01 and 8.C-1.01, Forestwide Goals 10, 14, and 19, and Objectives 19.01 and 19.02).

- Mast-producing trees are being out-competed by shrubs and non-mast producing tree species in previously regenerated stands. There is a need to release the mast-producing trees to ensure that they continue to be a component of mature and maturing stands in the Paint Creek Project area (Forestwide Goals 10 and 17, and Objectives 17.02 and 18.02).

- Adequate watering holes for wildlife are limited, as are wildlife habitat structures, e.g. cavity nesting sites, and wildlife openings in the area. There is a need to improve and/or provide opportunities for these habitat components in order to sustain or promote viable populations of wildlife species (Forestwide Goals 10 and 14, and Objective 14.02).

- Prior to proposed timber harvest activities, maintenance of approximately 11.4 miles of authorized road, the extension of an existing road, and the construction of 0.3 miles of temporary road are needed to provide for the removal of forest products from areas harvested for timber (Forestwide Goal 19).

- There are 3.7 miles of system roads in the area that are not needed for resource management and need to be decommissioned (Forestwide Goals 48 and 49, and Objective 49.01).

- There are 8.3 miles of road that need to be decommissioned if not needed for resource management, or converted to system roads (Goal 48).

Commercial and noncommercial timber harvest may be used to accomplish vegetation management objectives for early-successional forest creation in Prescription Areas 7.E.2 and 8.C. Commercial and noncommercial timber harvest may be used in Prescription Area 7.B.

After reviews, District personnel found that the Objectives are not being fully realized in Compartments 205, 206, 209, 210, 213-219, 223, 262 and 264. The Need for Action responds to the Goals and Objectives as outlined above, and helps move the project area towards the desired conditions as described in the RLRMP.

Proposed Action

This is a brief summary of the proposed actions, described in more detail in in Chapter 2. The actions proposed by the Forest Service to meet the Purpose and Need are:

1. Create 377 acres (17 stands) of early-successional forest. All 17 stands would require site preparation and release treatments.

2. Encourage oak and other mast-producing species on 769 acres (34 stands).

3. Thin 152 acres (eight stands) to promote stand health.

4. Maintain approximately 11.4 miles of prehaul road, reconstruct approximately 0.1 miles of an existing road, and construct 0.3 miles of temporary road in support of items 1 and 3.

5. Prescribed burn 1,955 acres in four burn blocks.

6. Improve wildlife habitat conditions through the placement of nest boxes and bat roost boxes, the construction of waterholes, and providing drumming logs.

7. Decommission approximately 3.7 miles of authorized and unauthorized road.

8. Authorize approximately 8.3 miles of unauthorized road.

Decision to be Made

The decision to be made is whether or not to implement all or portions of Alternative B (the Proposed Action), another action alternative, a combination of actions in order to fulfill the purpose and need, or to continue with existing management under the No Action Alternative. If a determination is made that the impact is not significant, then a "Finding of No Significant Impact" (FONSI) would be prepared and a Decision Notice would document the decision of the District Ranger. This Environmental Assessment (EA) analyzes the site-specific effects of management activities as proposed in the Paint Creek Project, and is tiered to the RLRMP, FEIS, and accompanying Record of Decision.

Public Involvement

The proposed action was provided to the public and other agencies for comment during scoping beginning March 11, 2013. One hundred eighty one letters were sent out to individuals, public and private agencies and organizations, and tribal governments; five responses were received. Information on the proposal was posted online at http://www.fs.fed.us/nepa/nepa_project_exp.php?project=41477. The official proposal has been published in the Schedule of Proposed Actions since March, 2013. Using comments from the public and other agencies, the Interdisciplinary Team developed a list of issues to address (see below).

Based on the Objection Resolution meeting and the letter dated December 8, 2014 that was forwarded to the objector on file, an additional 30 Day Notice and Comment period will be provided. This decision is a result of modifications made to the effects analysis in the Paint Creek EA. The NEPA process will continue as outlined in the 36 CFR 218 regulations.

Issues

Forty comments were derived from the five responses received during scoping. Thirty two comments fell into one or more of the following categories: 1) outside the scope of the proposed action; 2) already decided by law, regulation, Forest Plan, or other higher level decision; 3) not relevant to the decision to be made, 4) conjectural and not supported by scientific or factual

evidence; 5) general comment, suggestion, opinion, or position statement; 6) other agency or partners consultation, review, advice, recommendations, etc.; and/or 7) already considered in the proposed action or is standard procedure. All 32 comments were eliminated from detailed study in this Environment Assessment.

Content Analysis of the scoping comments, comment disposition, and issue development can be found in Appendix B. The original letters are located in the project file.

The following issues were developed from the remaining eight comments solicited during scoping.

PC 9. Develop an alternative dedicated to ecological restoration

The commenter urged the CNF to develop an alternative dedicated to ecological restoration, in which the creation of Early Successional Habitat is a secondary benefit of restoration management.

Response: The creation of early successional forest (habitat), as proposed in the Paint Creek Project, would have multiple primary and secondary benefits, including but not limited to restoring forest and wetland communities; providing early successional forest habitat for wildlife, including federally listed species, sensitive species, "demand" species, etc., that utilize this habitat type; promoting habitat/age class/structural diversity within the project area to increase plant and animal species diversity and to enhance recreational opportunities (e.g. nature/wildlife/wildflower viewing, driving for pleasure, hunting, etc.); creating waterholes to provide habitat for amphibians, crustaceans, and aquatic-dependent insects; treating/controlling non-native invasive species in the proposed treatment areas, improving habitat for native flora; improving Forest Service system roads, via pre-haul road maintenance, to reduce erosion and sedimentation; providing wood products for local needs; and providing jobs and payments to local and federal governments.

PC 10. Monitoring and adaptive management

The commenters state that "…we hope that the Draft EA will contain a discussion of how this project will be monitored and how adaptive management will be used in latter phases of this project or subsequent projects. As the FSM explains, "[a]daptive management, monitoring, and evaluation are *essential* to ecological restoration." In other words, monitoring and adaptive management commitments *must* be described along with the alternative(s)."

Response: Monitoring and adaptive management will be an integral part of the proposed Paint Creek Project. The monitoring protocols for the Paint Creek project, however, are currently being developed, so there is no specific monitoring plan available at this time. The process that is being developed would collect baseline data prior to implementation in order to assess restoration goals. Activities would be monitored post-treatment to determine if restoration goals were being met. Management actions would be evaluated based upon their success of achieving the restoration goal(s). Results would then be utilized to change or modify management activities in order to improve restoration success within the Paint Creek area and for future projects on the Cherokee National Forest.

PC 11. Devil's Kitchen Branch

The commenters state: "We would be disappointed to see the CNF pass over necessary, uncontroversial restoration [of white pine plantations at Devil's Kitchen Branch and low-diversity, poplar-dominated stands] in this project merely because funding is uncertain. Commercial or not, everyone seems to agree these areas (especially the pine plantations) are in the greatest need of restoration, and the Forest Plan specifically directs these types of restoration."

Response: We agree with the need for treating the white pine plantations in the "Devils Kitchen Branch" area. However, as the commenters point out, it wasn't considered economically feasible at the time of project development. While this still holds true, the IDT felt that it would be prudent to have the action available 'on the shelf' if/when funding does become available in the near future. Therefore, treatment of the white pine plantations in the "Devils Kitchen Branch" area will be added to alternative(s) to the Proposed Action.

PC 12. Exceed Forest Plan targets for ESH in Prescription 8.C

Commenters state that "Under the Forest Plan, ESH [early-successional habitat] caused by natural disturbances should be counted toward ESH objectives, so long as they occur in patches greater than 2 acres in size. We understand that wildfire has created ESH in the Paint Creek watershed and that this ESH was identified in a GIS layer by the Forest Service. Counting [the 179.3 acres of regeneration from fire], it appears that the project would create about 526.3 acres of ESH in the 8.C prescription, or about 110 acres more than the Plan allows…[this results in] 10.1% of the suitable acreage within [the 8.C] management area…a number out of compliance with the 8% maximum set out by the Cherokee NF RLRMP…we suggest that the CNF drop or modify the treatments for those excess acres. To begin with, the CNF should drop the regeneration harvests in the characteristic, mature forest on Meadow Ridge (Compartment 218, Stand 10 and a portion of Compartment 217, Stand 31) and in the coves and higher along ridge of Ricker Mountain (Compartment 214, Stand 15)."

Response: The 347 acres of proposed early-successional forest (a.k.a. ESH) creation in the 8.C prescription would result in 6.7% of the suitable National Forest System lands in the prescription being in the 0-10 age class. (There are approximately 5,206 suitable acres in the 8.C prescription in the project area.) As stated by the commenters, the upper limit for ESH in this prescription is 8%. GIS data shows the 179 acres of fire-created ESH in 8.C occurs in both suitable and unsuitable NFS lands.

Note: The 179 acres of ESH was created through prescribed burning, and not by wildfire as reported by the commenters. According to CNF GIS data, there have been seven wildfires, including both NFS and private lands, totaling approximately 65 acres within the Paint Creek Analysis Area between 2004 – 2012.

Of the 179 total acres of burn-created ESH, 79 acres occurs on suitable NFS land in the 8.C prescription. This would bring the total ESH (proposed plus burn-created) in 8.C to 426 acres or 8.2% of the prescription being in the 0-10 age class.

Looking at all of the project area's NFS lands in the 8.C prescription, both suitable and unsuitable, the 347 acres of proposed ESH would result in 5.2% of the prescription being in the 0-10 age class. (Due to a mapping error, the scoping letter reports 6,155 total acres of 8.C in the project area. The actual total should have been reported as 6,982 acres of 8.C.) Adding the 179 acres of regeneration in 8.C would bring the total ESH (proposed plus burn-created) to 526 acres or 7.5% of the prescription being in the 0-10 age class.

PC 13. Restore Cutshall Bog

The commenter states: "Several TNC [The Nature Conservancy] staff have visited Cutshall Bog and discussed the possibilities for restoring the bog to a more natural condition. The best option would be removal or relocation of the road though the bog."

Response: We agree with the necessity to move the road (FSR 93) out of the Cutshall Bog rare community in order to restore the bog to 'a more natural condition'. However, the section of road that passes through the bog would have to be replaced (i.e. relocated) to provide access into the Devils Kitchen area. Restoration in the Cutshall Bog rare community, including relocating FSR 93 out of the bog, will be included in alternative(s) to the Proposed Action.

Chapter 2: Alternatives including the Proposed Action

Chapter 2 describes the No Action, the Proposed Action and Alternatives to the Proposed Action. It includes a description of each alternative considered in this analysis. This section also presents the alternatives in comparative form, defining the differences between each alternative and providing a clear basis for choice among options by the decision maker and the public. This comparison is based on the actions and issues identified in Chapter 1. Each alternative is designed so as to reduce adverse impacts to resources.

Acreages, mileages, and volumes are based on the best information available (Geographical Information Systems (GIS), Stand Maps, etc.). Actual quantities would be determined during on-the-ground project layout. Percentages may vary slightly due to rounding. Stand ages are, unless otherwise stated, as of the year 2013, and are based on the preponderate age of dominant and co-dominant trees.

Alternative A (No Action)

This alternative responds to National Environmental Policy Act requirements [40 CFR 1502.14(d)] for a No Action Alternative. Selection of this alternative means no projects would be implemented in the project area at this time. Current uses of the area would continue until such uses were prohibited by changed environmental conditions.

Selection of Alternative A does not preclude future analysis or implementation of on-going management proposals within the project area. This alternative provides a baseline used to compare the environmental effects of the action alternatives.

Alternative B (Proposed Action)

This alternative is designed to move the Paint Creek project area from the current condition toward the desired future condition, as described in the RLRMP.

1. Provide Early Successional Forest

Approximately 377 acres (17 stands) of early successional forest (ESF) would be created for wildlife habitat needs in the Paint Creek project area. The 377 total acres equals approximately 5.2% of the suitable acreage (Table 2a).

Table 2a: Acres by Prescription

Prescription	Total Acres	Suitable Acres*	Acres Treated	Percent of Prescription	ESF Objective in RLRMP
7.B	2,608	1,102	30	2.7%	None
7.E.2	2,333	896	0	0%	4% - 10%
8.C	6,982	5,206	347	6.7%	4% - 8%
Totals	**11,923**	**7,204**	**377**	**5.2%**	

* Total acres of stands within the prescription having a suitable land classification.

Approximately 347 acres (17 stands) are proposed for ESF creation in the 8. C prescription. Approximately 30 acres of Stand 4 in Compartment 217 is in the 7.B prescription; the remaining 10 acres of the stand is in 8.C (Tables 2a and 2b). All of the ESF (377 acres total) would be regenerated utilizing commercial timber harvest through a Two-Age Regeneration Harvest (Shelterwood with Reserves).

Note: Gaps up to two-acres in size would be created to provide ESF in Compartment 214, Stands 13 and 20 and Compartment 215, Stands 22, 28, 47, and 53 (Table 2b). The remaining portions of these stands would be thinned (see Table 2e).

Table 2b: Early Successional Forest

Prescription	Compartment	Stand	Age	Acres	Forest Type
8.C	214	13	111	4	60: Chestnut oak – scarlet oak
8.C	214	15	111	32	45: Chestnut oak – scarlet oak – yellow pine
8.C	214	20	111	3	60: Chestnut oak – scarlet oak
8.C	214	26	111	15	60: Chestnut oak – scarlet oak
8.C	215	22	100	5	9: White pine – cove hardwood
8.C	215	28	83	10	56: Yellow poplar – white oak – northern red oak
8.C	215	46	100	40	41: Cove hardwood – white pine – hemlock
8.C	215	47	112	3	53: White oak – northern red oak – hickory
8.C	215	53	83	4	56: Yellow poplar – white oak – northern red oak
8.C	216	2	96	40	60: Chestnut oak – scarlet oak
8.C	216	25	95	29	41: Cove hardwood – white pine – hemlock
8.C	216	29	96	13	56: Yellow poplar – white oak – northern red oak
7.B	217	4	101	30	53: White oak – northern red oak – hickory
8.C	217	4	101	10	53: White oak – northern red oak – hickory
8.C	217	10	97	23	10: White pine – upland hardwood
8.C	217	31	110	40	42: Upland hardwood – white pine
8.C	217	36	93	36	41: Cove hardwood – white pine – hemlock
8.C	218	10	104	40	56: Yellow poplar – white oak – northern red oak
Total acres				**377**	

An average basal area of 15-25 ft²/acre of shelterwood reserve trees would be left on site to create a two-aged stand structure along with new regeneration. Merchantable trees would be marked for removal. Favored reserve trees include trees with dens, large and long-lived mast-producing trees and long-lived yellow pine. Likely species to leave would include black gum, white oak, red oak, hickory, chestnut oak and shortleaf pine. Each stand would be variable density marked resulting in areas of higher basal area where favorable leave trees may be clumped. Areas where fewer favorable leave trees occur may result in lower basal area, but the overall stand basal area would be between 15-25 ft²/acre.

All stands in Table 2b would require pre- and post-harvest site preparation and timber stand improvement release treatments:

- Pre-harvest site preparation: Prior to harvest, midstory species would be treated with an herbicide (Imazapyr and Glyphosate) to reduce post-harvest sprouting of overly-competitive species. (See Appendix C–Herbicide Use Assumptions for herbicide use data.) Major species targeted for treatment include red maple, white pine and rhododendron between 1 to 7 inches DBH. Treatment would occur one to three years prior to harvest, where applicable. Species not treated include dogwood and hard- and soft-mast producing species.

- Post-harvest Site Preparation for Natural Regeneration: Following logging, site preparation would include mechanical slash down (chainsaw) and/or herbicide treatment (Imazapyr and Glyphosate) of residual species between 1 to 7 inches DBH. Major species targeted for treatment include red maple, white pine and rhododendron. Treatment would occur one to two years post-harvest, where applicable. Species not treated include dogwood and hard- and soft-mast producing species.

- Timber Stand Improvement (TSI) Release Treatment: The need for TSI release would be determined after Post-harvest Site Preparation. Where needed, two to four years following harvest, overly-competitive sprouts would be treated using herbicides (Triclopyr). This would help to control competition from red maple, yellow poplar and other species.

Seedlings of blight resistant American chestnuts, red oak and/or other hard and soft mast species would be planted in regenerated areas, if seedlings become available.

2. Crop Tree

Use mechanical treatment methods (e.g. chainsaw) on approximately 674 acres (32 stands) to select and provide for the release of mast-producing trees (Table 2c). Stand 39 in Compartment 217 was split out from Stand 4, and would be a new stand. The remaining portion of 217-4 would be treated to create ESF (see Table 2b).

Table 2c: Crop Tree

Compartment	Stand	Acres
205	46	18
206	33	13
209	35	27
210	16	16
210	17	22
213	20	21
214	32	12
215	11	27
215	21	14
215	23	26
215	40	14
215	45	18
215	54	35
216	11	27
216	16	28

Compartment	Stand	Acres
217	1	13
217	2	16
217	13	21
217	20	28
217	39	17
218	6	32
219	49	13
219	50	16
223	1	5
223	14	13
223	25	25
262	4	42
262	26	20
262	31	44
264	15	20

Compartment	Stand	Acres
216	27	16
216	40	15

Compartment	Stand	Acres
Total acres		**674**

3. Midstory

The stocking density of the understory and midstory on 95 acres (two stands; Table 2d) would be reduced by about 25 percent using herbicides (Imazapyr and Glyphosate). The reduction in competition and increased sunlight would promote the development of mast-producing species.

Table 2d: Midstory

Compartment	*Stand*	Acres
217	17	47
217	33	48
Total acres		**95**

4. Thinning

Commercially thin approximately 125 acres (six stands) to an average basal area of 40 square feet per acre (Table 2e). Gaps up to two-acres in size would be created, where suitable, to provide ESF. The remaining portions of the stands would be commercially thinned. Two stands (27 acres) would be thinned noncommercially (Table 2e). Gaps would not be created in the noncommercially-thinned stands.

Table 2e: Thinning

Compartment	Stand	Acres	Forest Type
214	13	19	60: Chestnut oak – scarlet oak
214	20	17	60: Chestnut oak – scarlet oak
215	22	20	9: White pine – cove hardwood
215	28	41	56: Yellow poplar – white oak – northern red oak
215	47	12	53: White oak – northern red oak – hickory
215	53	16	56: Yellow poplar – white oak – northern red oak
262	14*	10	15: Pitch pine – oak
262	30*	17	60: Chestnut oak – scarlet oak
Total acres		**152**	

* *noncommercial*

Stands would be thinned to a final basal area ranging from 35 to 60 ft^2 /acre. Merchantable trees would be marked for removal. Priority for removal would first be damaged and diseased trees followed by scarlet oak, black oak, red maple, and white pine. Favored reserve trees include trees with dens, large and long-lived mast-producing trees and long-lived yellow pine. Likely species to leave would include black gum, white oak, hickory, chestnut oak and yellow pine. Thinning would improve species sustainability and promote stand vigor by reducing competition for light, nutrients, and moisture. Through forest health management, environmental assets would be

retained over the long term, whereas in the absence of treatment, they could be lost due insect and/or disease outbreaks.

All stands in Table 2e would receive, where needed, pre- and post-harvest site preparation treatments:

- Pre-harvest Site Preparation: Prior to harvest, midstory species would be treated with an herbicide (Imazapyr and Glyphosate) to reduce post-harvest sprouting of overly-competitive species. (See Appendix C – Herbicide Use Assumptions for herbicide use data.) Major species targeted for treatment include red maple, white pine and rhododendron between 1 to 7 inches DBH. Treatment would occur one to three years prior to harvest, where applicable. Species not treated include dogwood and hard-and soft-mast producing species.

- Post-harvest Site Preparation: Post-harvest site preparation in the stands listed in Table 2k is not required since the objective of the thinning treatment is not promoting natural regeneration. However, if and where site preparation is determined to be needed, residual species between 1 to 7 inches DBH would be mechanically slashed down (chainsaw) and/or treated using herbicides (Imazapyr and Glyphosate) following thinning. Major species targeted for treatment include red maple, white pine and rhododendron. Treatment would occur one to two years post-harvest, where applicable. Species not treated include dogwood and hard- and soft-mast producing species.

5. Maintain Existing, Reconstruct, and Create Temporary Roads

Approximately 11.4 miles of existing road would be maintained, and 0.3 miles of temporary road would be constructed in support of timber sale activities (Table 2f). The temporary road would be closed and rehabilitated (stabilized, water barred (where needed), and seeded and fertilized) after the timber sale. Approximately 0.1 miles of Hurricane Gap Road (FR 31) would be reconstructed to repair landslide damage.

Table 2f: Maintained, Reconstructed and Temporary Roads

Road #	Road Name	Miles	Action
22171	North Rough Branch	1.3	Pre-haul Maintenance
31	Hurricane Gap	5.5	Pre-haul Maintenance
31B	Little Paint Creek	0.7	Pre-haul Maintenance
3214	Ricker Mountain	2.0	Pre-haul Maintenance
422B1	New Bellcow Mountain	0.5	Pre-haul Maintenance
OR-14	North Courtland	1.4	Pre-haul Maintenance
Total Miles		**11.4**	
31	Hurricane Gap	**0.1**	Road Reconstruction
Temporary Road in C215/S47		**0.3**	Temporary Construction

6. Prescribed Burn

Conduct low-intensity burns on approximately 1,955 acres in four burn blocks (Table 2g). Fire control lines would include existing roads, streams, constructed dozer lines and hand lines. The primary objective of the burns is to promote the health of forest communities. Long-term beneficial effects include maintaining natural communities and stimulating new growth of vegetation that provide soft mast and herbaceous plants for wildlife. If, and where, post-burn monitoring determined that the burn objectives were not being fully met, a follow-up burn or burns would be conducted. Individual burn blocks may be reburned on a two to ten-year rotation.

Table 2g: Prescribed Burns

Burn Name	Acres
Brushy Branch	170
Devil's Kitchen	478
Ricker Mountain	87
Upper Paint Creek	1,220
Total acres	1,955

7. Wildlife Habitat Improvements

The following are proposed to improve habitat conditions for wildlife (Table 2h):

- Boxes – place roost boxes for bats and/or nest boxes for birds and small mammals. Two boxes are placed in stands proposed for early successional forest habitat creation.

- Water – construct waterholes, vernal (ephemeral) ponds/pools, or wetlands (~ $1/8^{th}$ acre) for aquatic insects, amphibians, bats and other wildlife. The type(s) of water resources constructed would vary depending on the current availability of water sources and wildlife needs in the treatment area.

- Logs – provide up to five drumming logs (eight inches or greater in diameter) for ruffed grouse in stands proposed for early successional forest habitat creation.

Table 2h: Terrestrial Wildlife Activities

Location	Boxes (each)	Water (feature)	Logs (each)
Compartment 214	4	1	10
Compartment 215	12	1	30
Compartment 216	6	0	15
Compartment 217	10	2	25
Compartment 218	2	1	5
Totals	**34**	**5**	**85**

Allen Gap Pond - Control encroaching woody vegetation to reduce shading effects and improve wetland habitat for rare species: noncommercially thin approximately two acres of white pine and hardwood trees, treat the woody vegetation with an aquatic-approved herbicide (glyphosate)

through direct application, and reduce the density of rhododendron. Work would include activities within and along edges of the wetland.

8. Roads to be Decommissioned

Approximately 2.8 miles of authorized roads and 0.9 miles of unauthorized roads (Old Road) would be decommissioned, per the recommendations provided in the Paint Creek Transportation Analysis Plan (TAP) (Table 2i).

Table 2i: Roads to be Decommissioned

Road #	Miles
41P	0.26
422	1.68
422B	0.38
5112	0.50
OR-2	0.01
OR-3	0.02
OR-4	0.07
OR-6	0.13
OR-7	0.15
OR-8	0.1
OR-9	0.13
OR-10	0.06
OR-11	0.07
OR-22	0.15
Total miles	**3.71**

9. Roads to be Authorized

Approximately 8.3 miles of roads would be authorized, per the recommendations provided in the Paint Creek TAP (Table 2j).

Table 2j: Roads to be Authorized

Road #	Road Name	Miles
OR-13	Band Mill Road	0.45
OR-14	North Courtland	1.40
OR-15	Courtland East	0.43
OR-16	Brushy Ridge	1.05
OR-17	Grassy Branch	0.97
OR-18	East Grassy Ridge	1.65
OR-19	West Grassy Ridge	0.78
OR-20	Paint Mountain East	1.37
OR-21	Courtland Place Loop	0.11
OR-23	Dillard Place	0.10

Road #	Road Name	Miles
Total miles		**8.31**

Alternative C

Alternative C is a modification of the Proposed Action. The modifications are based on issues identified during the scoping process.

1. Provide Early Successional Forest

Approximately 287 acres of early successional forest (ESF) would be created for wildlife habitat needs in the Paint Creek project area (but see Item #2 below). The 287 total acres equals approximately 3.5% of the suitable acreage (Table 2k).

Table 2k: ESFH Acres by Suitable Prescription

Prescription	Total Acres	Suitable Acres	Acres Treated	Percent of Prescription	ESF Objective in RLRMP
7.B	2,608	1,102	27	2.5%	None
7.E.2	2,333	896	89	9.9%	4% - 10%
8.C	6,982	5,206	171	3.3%	4% - 8%
Totals	**11,923**	**7,204**	**287**	**3.5%**	

Approximately 171 acres (16 stands) are proposed for ESF creation in the 8. C prescription and 89 acres (four stands) in 7.E.2. Twenty seven acres of Stand 4 in Compartment 217 is in the 7.B prescription (Table 2l). All of the ESF would be regenerated utilizing commercial timber harvest through a Two-Age Regeneration Harvest (Shelterwood with Reserves). However, depending on market conditions and other economic factors, some stands may be treated noncommercially.

Note: Gaps up to two-acres in size would be created to provide ESF in Compartment 214, Stands 13 and 20 and Compartment 215, Stands 22, 28, 47, and 53 (Table 2l). The remaining portions of these stands would be thinned (see Table 2o).

Table 2l: Early Successional Forest Habitat

Prescription	Compartment	Stand	Age	Acres	Forest Type
7.E.2	209	1	33	31	3: White pine
7.E.2	209	3	36	28	3: White pine
7.E.2	209	21	36	15	3: White pine
7.E.2	209	30[1]	106	15	53: White oak – northern red oak – hickory
8.C	214	13	111	4	60: Chestnut oak – scarlet oak
8.C	214	15[2]	111	6	45: Chestnut oak – scarlet oak – yellow pine
8.C	214	20	111	3	60: Chestnut oak – scarlet oak
8.C	214	26[2]	111	6	60: Chestnut oak – scarlet oak
8.C	215	22	100	5	9: White pine – cove hardwood
8.C	215	28	83	10	56: Yellow poplar – white oak – northern red oak
8.C	215	46	100	39	41: Cove hardwood – white pine – hemlock
8.C	215	47	112	3	53: White oak – northern red oak – hickory
8.C	215	53	83	4	56: Yellow poplar – white oak – northern red oak
8.C	216	2	96	13	60: Chestnut oak – scarlet oak
8.C	216	25	95	9	41: Cove hardwood – white pine – hemlock
8.C	216	29	96	8	56: Yellow poplar – white oak – northern red oak
7.B	217	4	101	27	53: White oak – northern red oak – hickory
8.C	217	4	101	8	53: White oak – northern red oak – hickory
8.C	217	10	97	18	10: White pine – upland hardwood
8.C	217	31	110	20	42: Upland hardwood – white pine
8.C	217	36	93	15	41: Cove hardwood – white pine – hemlock
Total acres				**287**	

[1] Stand 30 is a new stand created by combining portions of stands 5, 6, 38, and 39

[2] ESF in stands 15 and 26, compartment 209 would be small inclusions (two per stand, each approx. 2.0- to 3.0-acres in size) within the each stand. The remainder of the stands would be unchanged.

An average basal area of 15-25 ft²/acre of shelterwood reserve trees would be left on site to create a two-aged stand structure along with new regeneration. Merchantable trees would be marked for removal. Favored reserve trees include trees with dens, large and long-lived mast-producing trees and long-lived yellow pine. Likely species to leave would include black gum, white oak, red oak, hickory, chestnut oak and shortleaf pine. Each stand would be variable density marked resulting in areas of higher basal area where favorable leave trees may be clumped. Areas where fewer favorable leave trees occur may result in lower basal area, but the overall stand basal area would be between 15-25 ft²/acre.

All stands in Table 2l would require pre- and post-harvest site preparation and timber stand improvement release treatments:

- Pre-harvest site preparation: Prior to harvest, midstory species would be treated with an herbicide (Imazapyr and Glyphosate) to reduce post-harvest sprouting of overly-competitive species. (See Appendix C–Herbicide Use Assumptions for herbicide use data.) Major species targeted for treatment include red maple, white pine and rhododendron between 1 to

7 inches DBH. Treatment would occur one to three years prior to harvest, where applicable. Species not treated include dogwood and hard- and soft-mast producing species.

- Post-harvest Site Preparation for Natural Regeneration: Following logging, site preparation would include mechanical slash down (chainsaw) and/or herbicide treatment (Imazapyr and Glyphosate) of residual species between 1 to 7 inches DBH. Major species targeted for treatment include red maple, white pine and rhododendron. Treatment would occur one to two years post-harvest, where applicable. Species not treated include dogwood and hard- and soft-mast producing species.

- Timber Stand Improvement (TSI) Release Treatment: The need for TSI release would be determined after Post-harvest Site Preparation. Where needed, two to four years following harvest, overly-competitive sprouts would be treated using herbicides (Triclopyr). This would help to control competition from red maple, yellow poplar and other species.

Seedlings of blight resistant American chestnuts, red oak and/or other hard and soft mast species would be planted in regenerated areas, if seedlings become available.

2. Devil's Kitchen Branch Bog Rare Community

Devil's Kitchen Branch Bog (DKBB)—a forested streamside wetland/bog in the Southern Appalachian Eastern Hemlock (White Pine Type) Forest Community Type—is designated a rare community (Prescription 9.F) in the RLRMP (USDA Forest Service 2004a, p. 342-343). Found at the base of Greene Mountain, the DKBB encompasses approximately 82 acres, all within Compartment 209.

Prior to the DKBB area being designated a rare community (9.F), the majority of the area's mesic hardwood forest was treated in the late 1970s, and white pine was planted (as plantations) in most of the harvested stands. Some of these white pine stands now contain inclusions of 9.F associated with the DKBB (Table 2m).

Table 2m: Acres of 9.F to be treated

Prescription	Compartment	Stand	Age	Acres*	Forest Type
9.F	209	1	33	9	3: White pine
9.F	209	3	36	3	3: White pine
9.F	209	21	36	3	3: White pine
	Total acres			**15**	

* These acres are not included in Table 2l above.

Although white pine is a natural component within the DKBB's community type, white pine as plantations is not. The abundant seed source and recruitment from the plantations has allowed the white pine to spread within the DKBB area, threatening the rare community's stability. There is a need to remove the plantation structure and reduce the white pine component in the designated 9.F to help maintain the rare community, and to help restore a more characteristic (mesic hardwood) forest type within the upland portions of the DKBB area.

The RLRMP provides the following direction for management within the 9.F prescription:

- Desired Condition: Ecological disturbances are at the frequency and intensity needed to maintain desired composition, structure, and function. Generally, natural forces are sufficient to maintain these conditions; however, in some cases environmental factors have changed to the extent that natural processes are prevented or hindered from maintaining the community. In these cases, management activities used to restore or maintain desired conditions, such as prescribed burning or vegetation cutting, may be evident.

- Goal 9.F-1: Maintain and restore rare communities found on CNF lands.

    - Objective 9.F-1.02: Based on periodic monitoring of known rare community sites, identify management activities needed to maintain or restore characteristic structure, composition, and function of these communities, and implement an annual program of work designed to meet these needs.

        - RX9F-1: Manage rare community locations, wherever they occur across the CNF, under the 9.F (Rare Community) Prescription Goals, Objectives and Standards.
        - RX9F-16: This area is unsuitable for timber management.

Action: The following management activities are proposed to help restore and maintain the Devil's Kitchen Branch Bog rare community and promote mesic hardwood forest within 9.F:

- Treat approximately 15 acres of white pine, via the shelterwood method described above, to help restore the DKBB rare community.

- Prescribe burn approximately 478 acres within the Devil's Kitchen area, which includes the DKBB (included in action item #7 - Prescribed Burn, below).

3. Crop Tree

Use mechanical treatment methods (e.g. chainsaw) on approximately 49 acres (three stands) to select and provide for the release of mast-producing trees (Table 2n).

Table 2n: Crop Tree

Compartment	Stand	Acres
223	14	13
223	25	25
262	4	11
Total acres		**49**

4. Midstory

The stocking density of the understory and midstory on 84 acres (three stands; Table 2o) would be reduced by about 25 percent using herbicides (Imazapyr and Glyphosate). The reduction in competition and increased sunlight would promote the development of mast-producing species.

Table 2o: Midstory

Compartment	*Stand*	Acres
217	17	14
217	33	48
264	6	22
Total acres		**84**

5. Thinning

Commercially thin approximately 182 acres (14 stands) to an average basal area of 40 square feet per acre (Table 2p). Gaps up to two-acres in size would be created, where suitable, to provide ESF. The remaining portions of the stands would be commercially thinned. Two stands (21 acres total) would be thinned noncommercially. Gaps would not be created in the noncommercially-thinned stands.

Table 2p: Thinning

Compartment	Stand	Acres	Forest Type
209	6	9	53: White oak – northern red oak – hickory
209	19	11	59: Scarlet oak
209	34	4	53: White oak – northern red oak – hickory
209	35	3	53: White oak – northern red oak – hickory
209	38	3	53: White oak – northern red oak – hickory
209	39	7	56: Yellow poplar – white oak – northern red oak
214	13	16	60: Chestnut oak – scarlet oak
214	20	13	60: Chestnut oak – scarlet oak
215	22	27	9: White pine – cove hardwood
215	28	51	56: Yellow poplar – white oak – northern red oak
Compartment	**Stand**	**Acres**	**Forest Type**
215	47	14	53: White oak – northern red oak – hickory
215	53	10	56: Yellow poplar – white oak – northern red oak
262	14*	6	15: Pitch pine – oak
262	30*	15	60: Chestnut oak – scarlet oak
264	8	10	59: Scarlet oak
264	22	4	60: Chestnut oak – scarlet oak
Total acres		**203**	

* *noncommercial*

Stands would be thinned to a final basal area ranging from 35 to 60 ft² /acre. Merchantable trees would be marked for removal. Priority for removal would first be damaged and diseased trees

followed by scarlet oak, black oak, red maple, and white pine. Favored reserve trees include trees with dens, large and long-lived mast-producing trees and long-lived yellow pine. Likely species to leave would include black gum, white oak, hickory, chestnut oak and yellow pine. Thinning would improve species sustainability and promote stand vigor by reducing competition for light, nutrients, and moisture. Through forest health management, environmental assets would be retained over the long term, whereas in the absence of treatment, they could be lost due insect and/or disease outbreaks.

All stands in Table 2p would receive, where needed, pre- and post-harvest site preparation treatments:

- Pre-harvest Site Preparation: Prior to harvest, midstory species would be treated with an herbicide (Imazapyr and Glyphosate) to reduce post-harvest sprouting of overly-competitive species. (See Appendix C – Herbicide Use Assumptions for herbicide use data.) Major species targeted for treatment include red maple, white pine and rhododendron between 1 to 7 inches DBH. Treatment would occur one to three years prior to harvest, where applicable. Species not treated include dogwood and hard-and soft-mast producing species..

- Post-harvest Site Preparation: Post-harvest site preparation in the stands listed in Table 2k is not required since the objective of the thinning treatment is not promoting natural regeneration. However, if and where site preparation is determined to be needed, residual species between 1 to 7 inches DBH would be mechanically slashed down (chainsaw) and/or treated using herbicides (Imazapyr and Glyphosate) following thinning. Major species targeted for treatment include red maple, white pine and rhododendron. Treatment would occur one to two years post-harvest, where applicable. Species not treated include dogwood and hard- and soft-mast producing species.

6. Maintain Existing, Reconstruct, Construct, and Create Temporary Roads

Approximately 17.1 miles of existing road would be improved and maintained in support of timber sale activities (Table 2q). Improvement/maintenance activities include gravel placement and road grading.

Approximately 0.3 miles of temporary road would be constructed to provide access to stand 47 in compartment 215 (Table 2q). The temporary road would be closed, stabilized, water barred (where needed), and seeded and fertilized following completion of the timber sale.
Approximately 0.1 miles of Hurricane Gap Road (FR 31) would be reconstructed to repair damage from a landslide that removed part of the road.

Approximately 1.0 miles of Upper Rough Branch Road (FSR 93) would be relocated to protect Cutshall bog, and to provide access for the removal of timber products in the Devils Kitchen area (Compartment 209). The new section of FSR 93 would be new construction.

Table 2q: Maintained, Reconstructed, Constructed and Temporary Roads

Road #	Road Name	Miles	Action
22171	North Rough Branch	1.3	Pre-haul Maintenance
31	Hurricane Gap	5.5	Pre-haul Maintenance
31B	Little Paint Creek	0.7	Pre-haul Maintenance
3214	Ricker Mountain	2.0	Pre-haul Maintenance
422A	Rough Branch	2.7	Pre-haul Maintenance
422B1	New Bellcow Mountain	0.5	Pre-haul Maintenance
93	Upper Rough Branch	1.8	Pre-haul Maintenance
93A	Upper Rough Branch Spur	0.9	Pre-haul Maintenance
93C	Cemetery Road	0.3	Pre-haul Maintenance
OR-14	North Courtland	1.4	Pre-haul Maintenance
Total Miles		**17.1**	
31	Hurricane Gap	**0.1**	Road Reconstruction
93	Upper Rough Branch	**1.0**	Road Construction
Temporary Road in C215/S47		**0.3**	Temporary Construction

7. Prescribed Burn

Conduct low-intensity burns on approximately 1,955 acres in four burn blocks (Table 2r). Fire control lines would include existing roads, streams, constructed dozer lines and hand lines. The primary objective of the burns is to promote the health of forest communities. Long-term beneficial effects include maintaining natural communities and stimulating new growth of vegetation that provide soft mast and herbaceous plants for wildlife. If, and where, post-burn monitoring determined that the burn objectives were not being fully met, a follow-up burn or burns would be conducted. Individual burn blocks may be reburned on a two to ten-year rotation.

Table 2r: Prescribed Burns

Burn Name	Acres
Brushy Branch	170
Devil's Kitchen	478
Ricker Mountain	87
Upper Paint Creek	1,220
Total acres	1,955

8. Wildlife Habitat Improvements

The following are proposed to improve habitat conditions for wildlife (Table 2s):

- Boxes – place roost boxes for bats and/or nest boxes for birds and small mammals. Two boxes are placed in stands proposed for early successional forest habitat creation.

- Water – construct waterholes, vernal (ephemeral) ponds/pools, or wetlands (~ 1/8th acre) for aquatic insects, amphibians, bats and other wildlife. The type(s) of water resources constructed would vary depending on the current availability of water sources and wildlife needs in the treatment area.

- Logs – provide up to five drumming logs (eight inches or greater in diameter) for ruffed grouse in stands proposed for early successional forest habitat creation.

Table 2s: Terrestrial Wildlife Activities

Location	Boxes (each)	Water (feature)	Logs (each)
Compartment 214	4	1	10
Compartment 215	12	1	30
Compartment 216	6	0	15
Compartment 217	10	2	25
Compartment 218	2	1	5
Totals	**34**	**5**	**85**

In addition, the following actions would be implemented:

- Allen Gap Pond - Control encroaching woody vegetation to reduce shading effects and improve wetland habitat for rare species: noncommercially thin approximately two acres of white pine and hardwood trees, treat the woody vegetation with an aquatic-approved herbicide (glyphosate) through direct application, and reduce the density of rhododendron. Work would include activity within and along edges of the wetland.

- Cutshall Bog - Remove the section of FSR 93 bisecting the bog after it's been decommissioned. Control encroaching woody vegetation mechanically (chainsaws) and using an aquatic-approved herbicide (glyphosate) through direct application. Work would include activity within the bog and along bog edges to maintain open to semi-open conditions.

9. Roads to be Decommissioned

Approximately 3.8 miles of authorized roads and 0.9 miles of unauthorized roads (Old Road) would be decommissioned, per the recommendations provided in the Paint Creek Transportation Analysis Plan (TAP) (Table 2t). See Wildlife Habitat Improvements, Cutshall Bog, above regarding FSR 93.

Table 2t: Roads to be Decommissioned

Road #	Miles
41P	0.26
422	1.68
422B	0.38
5112	0.50
93	1.00
OR-2	0.01
OR-3	0.02
OR-4	0.07
OR-6	0.13
OR-7	0.15
OR-8	0.10
OR-9	0.13
OR-10	0.06
OR-11	0.07
OR-22	0.15
Total miles	**4.71**

10. Roads to be Authorized

Approximately 8.3 miles of roads would be authorized, per the recommendations provided in the Paint Creek TAP (Table 2u).

Table 2u: Roads to be Authorized

Road #	Road Name	Miles
OR-13	Band Mill Road	0.45
OR-14	North Courtland	1.40
OR-15	Courtland East	0.43
OR-16	Brushy Ridge	1.05
OR-17	Grassy Branch	0.97
OR-18	East Grassy Ridge	1.65
OR-19	West Grassy Ridge	0.78
OR-20	Paint Mountain East	1.37
OR-21	Courtland Place Loop	0.11
OR-23	Dillard Place	0.10
Total miles		**8.31**

Alternative D

Alternative D is a modification of the Proposed Action. The modifications are based on issues identified during the scoping process.

1. Provide Early Successional Forest

Approximately 395 acres of early successional forest (ESF) would be created for wildlife habitat needs in the Paint Creek project area (but see Note 1 below). The 395 total acres equals approximately 5.5% of the suitable acres (Table 2v).

Table 2v: Acres by Prescription

Prescription	Total Acres	Suitable Acres	Acres Treated	Percent of Prescription	ESF Objective in RLRMP
7.B	2,608	1,102	30	2.7%	None
7.E.2	2,333	896	18	2.0%	4% - 10%
8.C	6,155	5,206	347	6.7%	4% - 8%
Totals	**11,096**	**7,204**	**395**	**5.5%**	

Note 1: An approximately 3.0-acre inclusion in Stand 21, Compartment 209, is designated as 9.F, the Devil's Kitchen Branch Bog rare community. (See Alternative C, Item #2, Devil's Kitchen Branch Bog Rare Community for details on the need for treating the 9.F.) The inclusion is not displayed in Tables 2v and 2w. The three acres would bring the total ESF to be created to 398 acres, with the percent of suitable acreage proposed to be treated remaining the same (5.5%).

Approximately 347 acres (17 stands) are proposed for ESF creation in the 8.C prescription and approximately 15 acres (one stand) in 7.E.2. Approximately 30 acres of Stand 4, Compartment 217 is in the 7.B prescription (Table 2w). All of the ESF would be regenerated utilizing commercial timber harvest through a Two-Age Regeneration Harvest (Shelterwood with Reserves). However, depending on market conditions and other economic factors, some stands may be treated noncommercially.

Note 2: Gaps up to two-acres in size would be created to provide ESF in Compartment 214, Stands 13 and 20 and Compartment 215, Stands 22, 28, 47, and 53 (Table 2w). The remaining portions of these stands would be thinned (see Table 2z).

Table 2w: Early Successional Forest

Prescription	Compartment	Stand	Age	Acres	Forest Type
7.E.2	209	21	36	18	3: White pine
8.C	214	13	111	4	60: Chestnut oak – scarlet oak
8.C	214	15	111	32	45: Chestnut oak – scarlet oak – yellow pine
8.C	214	20	111	3	60: Chestnut oak – scarlet oak
8.C	214	26	111	15	60: Chestnut oak – scarlet oak
8.C	215	22	100	5	9: White pine – cove hardwood
8.C	215	28	83	10	56: Yellow poplar – white oak – northern red oak
8.C	215	46	100	40	41: Cove hardwood – white pine – hemlock
8.C	215	47	112	3	53: White oak – northern red oak – hickory
8.C	215	53	83	4	56: Yellow poplar – white oak – northern red oak
8.C	216	2	96	40	60: Chestnut oak – scarlet oak
8.C	216	25	95	29	41: Cove hardwood – white pine – hemlock
Prescription	**Compartment**	**Stand**	**Age**	**Acres**	**Forest Type**
8.C	216	29	96	13	56: Yellow poplar – white oak – northern red oak
7.B	217	4	101	30	53: White oak – northern red oak – hickory
8.C	217	4	101	10	53: White oak – northern red oak – hickory
8.C	217	10	97	23	10: White pine – upland hardwood
8.C	217	31	110	40	42: Upland hardwood – white pine
8.C	217	36	93	36	41: Cove hardwood – white pine – hemlock
8.C	218	10	104	40	56: Yellow poplar – white oak – northern red oak
	Total acres			**395**	

An average basal area of 15-25 ft²/acre of shelterwood reserve trees would be left on site to create a two-aged stand structure along with new regeneration. Merchantable trees would be marked for removal. Favored reserve trees include trees with dens, large and long-lived mast-producing trees and long-lived yellow pine. Likely species to leave would include black gum, white oak, red oak, hickory, chestnut oak and shortleaf pine. Each stand would be variable density marked resulting in areas of higher basal area where favorable leave trees may be clumped. Areas where fewer favorable leave trees occur may result in lower basal area, but the overall stand basal area would be between 15-25 ft²/acre.

All stands in Table 2w would require pre- and post-harvest site preparation and timber stand improvement release treatments:

- Pre-harvest site preparation: Prior to harvest, midstory species would be treated with an herbicide (Imazapyr and Glyphosate) to reduce post-harvest sprouting of overly-competitive species. (See Appendix C–Herbicide Use Assumptions for herbicide use data.) Major species targeted for treatment include red maple, white pine and rhododendron between 1 to 7 inches DBH. Treatment would occur one to three years prior to harvest, where applicable. Species not treated include dogwood and hard- and soft-mast producing species.

- Post-harvest Site Preparation for Natural Regeneration: Following logging, site preparation would include mechanical slash down (chainsaw) and/or herbicide treatment (Imazapyr and Glyphosate) of residual species between 1 to 7 inches DBH. Major species targeted for treatment include red maple, white pine and rhododendron. Treatment would occur one to two years post-harvest, where applicable. Species not treated include dogwood and hard- and soft-mast producing species.

- Timber Stand Improvement (TSI) Release Treatment: The need for TSI release would be determined after Post-harvest Site Preparation. Where needed, two to four years following harvest, overly-competitive sprouts would be treated using herbicides (Triclopyr). This would help to control competition from red maple, yellow poplar and other species.

Seedlings of blight resistant American chestnuts, red oak and/or other hard and soft mast species would be planted in regenerated areas, if seedlings become available.

2. Crop Tree

Use mechanical treatment methods (e.g. chainsaw) on approximately 674 acres (32 stands) to select and provide for the release of mast-producing trees (Table 2x). Stand 39 in Compartment 217 would be a new stand, and was split out from Stand 4. The remaining portion of Stand 4 would be treated to create ESF (see Table 2w).

Table 2x: Crop Tree

Compartment	Stand	Acres
205	46	18
206	33	13
209	35	27
210	16	16
210	17	22
213	20	21
214	32	12
215	11	27
215	21	14
215	23	26
215	40	14
215	45	18
215	54	35
216	11	27
216	16	28
216	27	16
216	40	15

Compartment	Stand	Acres
217	1	13
217	2	16
217	13	21
217	20	28
217	39	17
218	6	32
219	49	13
219	50	16
223	1	5
223	14	13
223	25	25
262	4	42
262	26	20
262	31	44
264	15	20
Total acres		**674**

3. Midstory

The stocking density of the understory and midstory on 513 acres (15 stands; Table 2y) would be reduced by about 25 percent using herbicides (Imazapyr and Glyphosate). The reduction in competition and increased sunlight would promote the development of mast-producing species.

Table 2y: Midstory

Compartment	Stand	Acres
209	6	17
209	19	66
209	32	3
209	33	4
209	34	36
209	36	35
209	37	13
209	38	15
209	39	29
217	17	47
217	33	48
Compartment	**Stand**	**Acres**
264	6	22
264	8	52
264	9	86
264	22	40
Total acres		**513**

4. Thinning

Commercially thin approximately 125 acres (six stands) to an average basal area of 40 square feet per acre (Table 2p). Gaps up to two-acres in size would be created, where suitable, to provide ESF. The remaining portions of the stands would be commercially thinned. Two stands (27 acres total) would be thinned noncommercially (Table 2z). Gaps would not be created in the noncommercially-thinned stands.

Table 2z: Thinning

Compartment	Stand	Acres	Forest Type
214	13	19	60: Chestnut oak – scarlet oak
214	20	17	60: Chestnut oak – scarlet oak
215	22	20	9: White pine – cove hardwood
215	28	41	56: Yellow poplar – white oak – northern red oak
215	47	12	53: White oak – northern red oak – hickory
215	53	16	56: Yellow poplar – white oak – northern red oak
262	14*	10	15: Pitch pine – oak
262	30*	17	60: Chestnut oak – scarlet oak
Total acres		**152**	

* *noncommercial*

Stands would be thinned to a final basal area ranging from 35 to 60 ft² /acre. Merchantable trees would be marked for removal. Priority for removal would first be damaged and diseased trees followed by scarlet oak, black oak, red maple, and white pine. Favored reserve trees include trees with dens, large and long-lived mast-producing trees and long-lived yellow pine. Likely species to leave would include black gum, white oak, hickory, chestnut oak and yellow pine. Thinning would improve species sustainability and promote stand vigor by reducing competition for light, nutrients, and moisture. Through forest health management, environmental assets would be retained over the long term, whereas in the absence of treatment, they could be lost due insect and/or disease outbreaks.

All stands in Table 2z would receive, where needed, pre- and post-harvest site preparation treatments:

- Pre-harvest Site Preparation: Prior to harvest, midstory species would be treated with an herbicide (Imazapyr and Glyphosate) to reduce post-harvest sprouting of overly-competitive species. (See Appendix C – Herbicide Use Assumptions for herbicide use data.) Major species targeted for treatment include red maple, white pine and rhododendron between 1 to 7 inches DBH. Treatment would occur one to three years prior to harvest, where applicable. Species not treated include dogwood and hard-and soft-mast producing species..

- Post-harvest Site Preparation: Post-harvest site preparation in the stands listed in Table 2k is not required since the objective of the thinning treatment is not promoting natural regeneration. However, if and where site preparation is determined to be needed, residual species between 1 to 7 inches DBH would be mechanically slashed down (chainsaw) and/or treated using herbicides (Imazapyr and Glyphosate) following thinning. Major species targeted for treatment include red maple, white pine and rhododendron. Treatment would occur one to two years post-harvest, where applicable. Species not treated include dogwood and hard- and soft-mast producing species.

5. Group Selection with Thinning

Approximately 103 acres (four stands) would be treated through group selection with thinning treatments (Table 2aa). Stands 1, 3 and 4 contain nine-, three-, and three-acre inclusions, respectively, of Prescription 9.F (rare community). See Alternative C, Item #2, Devil's Kitchen Branch Bog Rare Community, for details on treating within the 9.F.

Table 2aa: Group Selection with Thinning

Compartment	Stand	Acres	Forest Type
209	1	40	3: White pine
209	3	31	3: White pine
209	4	17	38: Pitch pine
209	7	15	38: Pitch pine
Total acres		**103**	

Approximately 20% of the stand area would consist of one to two-acre groups scattered across and within the stand. Groups would not be created in the designated 9.F. All attempts would be made to place the groups in areas of white pine, poplar and red maple with high basal areas. Residual basal area with the groups would be 0-15 basal area per acre, depending on species composition and terrain. The remaining portion of the stand would be thinned to a final basal area ranging from 35 to 60 feet² /acre. Priority for removal would first be damaged and diseased trees followed by white pine, red maple, scarlet oak, and black oak. Favored reserve trees would include trees with dens, large and long-living mast-producing trees and long-lived yellow pine. Likely species to leave include black gum, white oak, hickory, chestnut oak and yellow pine. Thinning would improve species sustainability and promote stand vigor by reducing competition for light, nutrients, and moisture. Through forest health manipulation, environmental assets would be retained over the long term, whereas in the absence of treatment, they could be lost due an insect and/or disease outbreak.

Following harvest, each stand would be evaluated for the need for mechanical stand improvement treatments (chainsaw slashdown) and/or multiple low-intensity prescribed burns. These treatments are designed to reduce undesirable competition and to promote vigor within the stand. The groups would also be evaluated for possible planting of northern red oak, white oak and shortleaf pine.

6. Maintain Existing, Reconstruct, Construct, and Create Temporary Roads

Approximately 16.2 miles of existing road would be improved and maintained in support of timber sale activities (Table 2bb). Improvement/maintenance activities include gravel placement and road grading.

Approximately 0.3 miles of temporary road would be constructed to provide access to stand 47 in compartment 215 (Table 2bb). The temporary road would be closed, stabilized, water barred (where needed), and seeded and fertilized following completion of the timber sale.

Approximately 0.1 miles of Hurricane Gap Road (FR 31) would be reconstructed to repair landslide damage.

Approximately 1.0 miles of Upper Rough Branch Road (FSR 93) would be relocated to protect Cutshall bog, and to provide access for the removal of timber products in the Devils Kitchen area (Compartment 209). The new section of FSR 93 would be new construction.

Table 2bb: Maintained, Constructed, Reconstructed and Temporary Roads

Road #	Road Name	Miles	Action
22171	North Rough Branch	1.3	Pre-haul Maintenance
31	Hurricane Gap	5.5	Pre-haul Maintenance
31B	Little Paint Creek	0.7	Pre-haul Maintenance
3214	Ricker Mountain	2.0	Pre-haul Maintenance
422A	Rough Branch	2.7	Pre-haul Maintenance
422B1	New Bellcow Mountain	0.5	Pre-haul Maintenance
93	Upper Rough Branch	1.8	Pre-haul Maintenance
93C	Cemetery Road	0.3	Pre-haul Maintenance
OR-14	North Courtland	1.4	Pre-haul Maintenance
Total Miles		**16.2**	
31	Hurricane Gap	**0.1**	Road Reconstruction
93	Upper Rough Branch	**1.0**	Road Construction
Temporary Road in C215/S47		**0.3**	Temporary Construction

7. Prescribed Burn

Conduct low-intensity burns on approximately 1,955 acres in four burn blocks (Table 2cc). Fire control lines would include existing roads, streams, constructed dozer lines and hand lines. The primary objective of the burns is to promote the health of forest communities. Long-term beneficial effects include maintaining natural communities and stimulating new growth of vegetation that provide soft mast and herbaceous plants for wildlife. If, and where, post-burn monitoring determined that the burn objectives were not being fully met, a follow-up burn or burns would be conducted. Individual burn blocks may be reburned on a two to ten-year rotation.

Table 2cc: Prescribed Burns

Burn Name	Acres
Brushy Branch	170
Devil's Kitchen	478
Ricker Mountain	87
Upper Paint Creek	1,220
Total acres	1,955

8. Wildlife Habitat Improvements

The following are proposed to improve habitat conditions for wildlife (Table 2dd):

- Boxes – place roost boxes for bats and/or nest boxes for birds and small mammals. Two boxes are placed in stands proposed for early successional forest habitat creation.

- Water – construct waterholes, vernal (ephemeral) ponds/pools, or wetlands (~ 1/8th acre) for aquatic insects, amphibians, bats and other wildlife. The type(s) of water resources constructed would vary depending on the current availability of water sources and wildlife needs in the treatment area.

- Logs – provide up to five drumming logs (eight inches or greater in diameter) for ruffed grouse in stands proposed for early successional forest habitat creation.

Table 2dd: Terrestrial Wildlife Activities

Location	Boxes (each)	Water (feature)	Logs (each)
Compartment 214	4	1	10
Compartment 215	12	1	30
Compartment 216	6	0	15
Compartment 217	10	2	25
Compartment 218	2	1	5
Totals	**34**	**5**	**85**

In addition, the following actions would be implemented:

- Allen Gap Pond - Control encroaching woody vegetation to reduce shading effects and improve wetland habitat for rare species: noncommercially thin approximately two acres of white pine and hardwood trees, treat the woody vegetation with an aquatic-approved herbicide (Glyphosate) through direct application, and reduce the density of rhododendron. Work would include activities within and along edges of the wetland.

- Cutshall Bog - Remove the section of FSR 93 bisecting the bog after it's been decommissioned. Control encroaching woody vegetation mechanically (chainsaws) and with an aquatic-approved herbicide (Glyphosate) through direct application. Work would include activities within the bog and along bog edges to maintain open to semi-open conditions.

- Devil's Kitchen Bog and Rough Branch Beaver Pond - Control encroaching woody vegetation mechanically (chainsaws) and with an aquatic-approved herbicide (Glyphosate) through direct application. Work would include activity within and along edges of the three wetland areas to maintain open to semi-open conditions.

9. Roads to be Decommissioned

Approximately 3.8 miles of authorized roads and 0.9 miles of unauthorized roads (Old Road) would be decommissioned, per the recommendations provided in the Paint Creek Transportation Analysis Plan (TAP) (Table 2ee). See Wildlife Habitat Improvements, Cutshall Bog, above regarding FSR 93.

Table 2ee: Roads to be Decommissioned

Road #	Miles
41P	0.26
93	1.00
422	1.68
422B	0.38
5112	0.50
OR-2	0.01
OR-3	0.02
OR-4	0.07
OR-6	0.13
OR-7	0.15
OR-8	0.10
OR-9	0.13
OR-10	0.06
OR-11	0.07
OR-22	0.15
Total miles	**4.71**

10. Roads to be Authorized

Approximately 8.3 miles of roads would be authorized, per the recommendations provided in the Paint Creek TAP (Table 2ff).

Table 2ff: Roads to be Authorized

Road #	Road Name	Miles
OR-13	Band Mill Road	0.45
OR-14	North Courtland	1.40
OR-15	Courtland East	0.43
OR-16	Brushy Ridge	1.05
OR-17	Grassy Branch	0.97
OR-18	East Grassy Ridge	1.65
OR-19	West Grassy Ridge	0.78
OR-20	Paint Mountain East	1.37
OR-21	Courtland Place Loop	0.11
OR-23	Dillard Place	0.10
Total miles		**8.31**

Design Criteria

Specific actions may be incorporated into the project design during the development of alternatives based on resource concerns and issues raised during scoping and analysis. Design criteria are intended to lessen or eliminate potential impacts from proposed activities. Criteria may or may not be included in RLRMP Standards and Guidelines, or may impose a stricter application of a Standard or Guideline. Design Criteria Common to All Action Alternatives includes:

1. Use broad-based dips or water bars on all access ways on non-level slopes.
2. Use a hydrologist or wildlife biologist to assist in the location of ephemeral pools, springs and seeps.
3. Implement Tennessee Best Management Practices (BMPs) as a minimum to achieve soil and water quality objectives. When RLRMP Standards exceed BMPs, the standards shall take precedence over Tennessee BMPs.
4. Streamside management zones (riparian corridors and filter zones) would be established, as specified in the RLRMP.
5. Any new threatened, endangered, and/or sensitive species locations discovered within a project area may result in all actions being delayed or interrupted within the area. The appropriate district wildlife/fisheries biologist or botanist would be consulted to determine effects of the action on the species.
6. Trees known to have been used as roosts by Indiana bats are protected from cutting and/or modification until they are no longer suitable as roost trees unless necessary for public safety. Consultation with the US Fish and Wildlife Service (FWS) must occur before cutting or modification.
7. To avoid injury to young Indiana bats, prescribed burning of potential maternity roosting habitat between May 1 and August 15 is prohibited, unless otherwise determined by consultation with the FWS.
8. Snags with exfoliating bark are not intentionally felled unless necessary for public safety. Exceptions may be made for small-scale projects such as insect/disease control, salvage harvesting, and facility construction.

9. During all silvicultural treatments in hardwood forest types, retention priority is given to the largest available trees that exhibit characteristics favored by roosting Indiana bats.
10. Leave (reserve) areas and exclusions would be established, where necessary to minimize impacts to rare species. All ground-disturbing activities (temporary roads, landings, skid trails, etc.) and timber harvest would be excluded from within the reserve areas.
11. Mixing-water for herbicide use would be brought to the site by work crews and not obtained from streams or other bodies of water.
12. No herbicide would be applied within 30 feet of open water except for selective treatments that use herbicides labeled for aquatic use.
13. Off-road equipment would be cleaned of seeds, soil, vegetative matter and other debris that could hold NNIS seeds and/or propogules. Off-road equipment would be inspected by a Forest Service representative to prevent NNIS introduction or spread in the project areas.
14. Build the fewest skid trails, logging roads, and log landings as feasible.
15. Skid trails would be placed and rehabilitated in a way that limits the spread of existing non-native invasive species from roads, trails, or powerline corridors, into stand interiors. Skid trails and plow lines would be rehabilitated (re-contoured, seeded, etc.) after they are no longer needed.
16. Any cultural resource sites found during implementation of the project would be reported immediately to a Forest Service Archaeologist and work would stop in the area.
17. Skid trails and temporary roads for the purpose of timber harvest would not be constructed for sustained distances over 200 feet in areas with slopes of 40% or greater ("steep area"). The 200-foot length can be exceeded however where the skid trail and/or temporary road is needed to traverse a steep area in order to access the remaining harvest unit(s). Trees within the traversed steep area would not be harvested, except where possible through cable winching to equipment placed outside the steep area.
18. Blend the visual impacts of roads and skid trails so they remain subordinate to the existing landscape character in size, form, line, color and texture.
19. Orient openings to blend with the existing landscape characteristics, based on existing vegetation patterns, contours and other natural-appearing features.
20. Shape and feather unit boundaries to avoid straight edges.
21. Retain natural-appearing tree groupings.
22. Minimize the exposure of mineral soils during construction of skid roads and trails, and revegetate cut-and-fill slopes to the extent possible.
23. Screen log landings from view, and restore as close to the original contour as possible.
24. Minimize impacts to existing trails and travelways, and maintain the visual character in the vicinity of trail corridors and travelways.
25. In addition to or in some cases, in lieu of seeding, ground cover shall be applied to all bladed areas with greater than 10% slope on the following soil map units as part of erosion control: Brasstown, Cataska, Junaluska, and Northcove. (Appendix F5) Ground cover, may include mulch, logging slash, natural leaf-fall, etc. These areas will also have drainage controls installed before closure.

Comparison of Alternatives

Table 2gg provides a comparison of the activities by each alternative. Information provided is focused on activities and quantitative outputs among the alternatives.

Table 2gg: Summary Comparison of Alternatives

Proposed Activity	Units	Alt A	Alt B	Alt C	Alt D
Vegetation Management					
Shelterwood regeneration (commercial)	acres	0	377	302	398
Crop tree (noncommercial)	acres	0	674	49	674
Midstory (herbicide)	acres	0	95	84	513
Thinning (commercial)	acres	0	125	182	125
Thinning (noncommercial)	acres	0	27	21	27
Group Selection (commercial/noncommercial)	acres	0	0	0	103
Proposed Activity	**Units**	**Alt A**	**Alt B**	**Alt C**	**Alt D**
Fire					
Prescribed burn	acres	0	1,955	1,955	1,955
Wildlife Habitat Improvement					
Provide, maintain, and monitor wildlife boxes	each	0	34	34	34
Construct, maintain, and monitor waterholes	each	0	5	5	5
Provide drumming logs	each	0	85	85	85
Restoration work: Allen Gap Pond	acres	0	2	2	2
Restoration work: Cutshall Bog	acres	0	0	23	23
Restoration work: Devil's Kitchen Bog	acres	0	0	0	9
Restoration work: Rough Branch Beaver Pond	acres	0	0	0	2
Transportation					
Prehaul maintenance	miles	0	11.4	17.1	16.2
Reconstruct existing road	miles	0	0.1	0.1	0.1
Construct permanent road	miles	0	0	1.0	1.0
Temporary road construction	miles	0	0.3	1.1	0.3
Decommission system roads	miles	0	3.7	4.7	4.7
Authorize roads	miles	0	8.3	8.3	8.3

Chapter 3: Affected Environment and Environmental Consequences

This section summarizes the physical, biological, social and economic environments of the affected project area and the potential changes to those environments due to implementation of the alternatives. It also presents the scientific and analytical basis for comparison of the alternatives.

Soil and Water Resources

The Paint Creek project is located approximately 12 miles south of Greeneville, Tennessee. The vast majority of the project area, defined here as all private and public lands within the Paint Creek Watershed Analysis Area, is in Greene County, with a few acres in Cocke County. Project area boundaries are formed by Paint Mountain and Greene Mountain to the west and north, and the Bald Mountains to the east and south.

The Paint Creek project area covers approximately 19,911 acres: 3,775 acres of private lands and 16,136 acres of National Forest System (NFS) lands. The majority (19,679 acres or 99%) of the project area is situated in the Blue Ridge physiographic province. The remaining 1% (214 acres) is located in the Ridge and Valley physiographic province (TDEC 2000). The Blue Ridge physiographic province characteristically exhibits steep mountain terrain in headwater areas where much of the planned management activities for the Paint Creek project would occur. The rocks are primarily Precambrian and Cambrian-age sedimentary (sandstone, shale, quartzite, arkose). The majority of stands proposed for treatment in all alternatives are underlain by the Ocoee Supergroup (pCo). Detailed information on dominant Geologic formations in the project area is presented in Appendix F1.

Elevations range from 4,844 feet on top of Camp Creek Bald to 1,240 feet where Paint Creek flows into the French Broad River. Average annual temperature is 56 degrees Fahrenheit. January is generally the coldest month with an average temperature of 35 degrees Fahrenheit, with July typically the hottest month, averaging 75 degrees Fahrenheit. Precipitation averages 44 inches a year with the highest average (6.39 inches) occurring in July. The least rainfall (3.61 inches average) occurs in October (NRCS 2013a). The growing season is estimated to be 151 days, with prevailing winds predominantly from the southwest (NRCS 2013b).

Soils

Regulatory Framework

The regulatory framework providing direction and guidance for protection of a soil's inherent capacity and productivity comes from the principle sources below:

- Forest Service Manual - Section 2500 (WO Amendment 2500-90-2)
- Multiple-Use Sustained-Yield Act of 1960
- National Forest Management Act of 1976
- Forest Service Handbook - FSH 2509.18-2003-1, Region 8 Soil Quality Standards
- Land and Resource Management Plan, Cherokee National Forest, 2004
- Guide to Forestry Best Management Practices in Tennessee (TDF 2003)

- Forest Service - Region 8 Soil and Water Conservation Practices (SWCPs) Handbook, 2003

The Cherokee Forest Plan goal for soil productivity is "GOAL 6: Design and implement projects in ways that will maintain or improve the long-term productive capacity of the soil" (USDA Forest Service, 2004). There are multiple Forest Plan Standards related to soil productivity In summary the standards identify the use of best management practices during projects to avoid impacts to soils, and minimize the extent of detrimental soil disturbance to less than 15 percent of vegetation management treatment areas.

Scope of Analysis

The scope of the analysis for direct and indirect effects to soils is primarily the stands proposed for commercial timber harvest, including timber harvest-related road maintenance and temporary road construction, and the proposed road authorizations. Other ground disturbing actions within these stands, such as the proposed prescribed burning, wildlife improvements, road decommissioning, etc. are considered part of the analysis as well.

The time period for the analysis is the past 10 years since research demonstrates that the majority of direct and indirect effects on soils recover, post treatment, to baseline or near-baseline levels within this timeframe. The cumulative effects analysis also considers future activities in the next five years since this timeframe coincides roughly with USFS out-year planning.

The Southern Region Soil Quality Standards (R8 Supplement 2509.18-2003-1) were designed to be applied at the project level of activities. For harvest operations, the activity areas are identified as the stands to be treated and any associated temporary roads and log landings. For these activities, the intent of this analysis was not to assess the existing site conditions and effects to the soil productivity across the entire "project area". Rather, the scope of this analysis was narrowed to assess the existing site conditions and effects to soil productivity within the immediate vicinity of the proposed management activities.

The Southern Region Forest Service Soil Management Handbook (USDA-FS-R8-2509.18, 2003) describes a standard of measure for soil quality based on area extent of disturbance to soils by an activity. This direction (excerpt below from soil quality standard 4) states that soil impairment does not occur when the following are within limits:

a. *At least 85 percent of an activity area is left in a condition of acceptable potential soil productivity following land management activities.*
b. *Compaction in an activity area should not significantly impair soil productivity*

Field visits by Forest Service personnel, Geographic Information System data, records of past activities, and information from the soil surveys for the Cherokee National Forest were used to evaluate the impacts of proposed activities. The description of anticipated impacts to the soil resource was based on the sensitivity of the soils in the project area and the amount of soil proposed activities are likely to disturb.

Affected Environment

Eight different soil series were inventoried and classified during soil survey mapping within the project area boundaries. This information was derived from an analysis of existing GIS map and attribute data. All of the series identified are upland soils with the exception of the Craigsville Series which is riparian. Table 3a displays all analysis area soil series by slope gradient. These slope groupings can aid in identifying possible operation constraints or need for additional mitigation measures. A stand-by-stand listing of soil map units is presented in Appendix F1, along with details of the alternative(s) in which that stand is included. Stand-by-stand soil maps are presented in Appendix F2.

Table 3a. Analysis Area Soils

Slope Class and Soil Series	Acres	Percent of Analysis Area
<20%	**172**	**26%**
Brasstown	42	6%
Craigsville	34	5%
Junaluska-Brasstown Complex	96	15%
20% to 35%	**132**	**20%**
Junaluska-Brasstown Complex	75	11%
Maymead	9	1%
Northcove	16	2%
>35%	**356**	**54%**
Brasstown	17	3%
Cataska	1	0%
Junaluska-Brasstown Complex	235	36%
Northcove	47	7%
Soco	25	4%
Unicoi Rock Outcrop	31	5%
Grand Total	**660**	**100%**

Table 3b displays two key soil properties (soil texture and depth to a restrictive layer – typically bedrock) and three important interpretations for the soil series in the analysis area (erosion hazard, rutting hazards and harvest equipment operability). The erosion hazard column assesses the likelihood that erosion of soil will occur when soil surface is exposed. The rutting hazard column assesses the operation of equipment (3 to 10 passes) when soil moisture is near field capacity. A rating of moderate indicates ruts are likely with the need for mitigations. Harvest equipment operability assesses the use of standard rubber-tired skidders and felling machines for harvesting operating from 35 to 75 percent of an area with the potential for rutting to a depth of 18 inches. These interpretations are defined in greater detail in the footnotes for Table 3b (NRCS, Web Soil Survey, 2014).

Table 3b: Analysis Area Soil Interpretations [1]

Map Unit Symbol [2]	Map Unit Name, Soil Texture	Acres	Depth to Restrictive Layer	Erosion Hazard[3]	Rutting Hazards[4]	Harvest Equipment Operability[5]
BtC	Brasstown, loam	42	40 to 60 inches	Slight	Severe	Moderately suited
BtG	Brasstown, loam	17	40 to 60 inches	V. Severe	Severe	Poorly suited
CcG	Cataska, channery silt loam	1	10 to 20 inches	V. Severe	Severe	Poorly suited
CrC	Craigsville, cobbly sandy loam	34	> 60 inches	Slight	Moderate	Moderately suited
JbD	Junaluska-Brasstown complex, sandy loam	96	20 to 40 inches	Moderate	Severe	Moderately suited
JbE	Junaluska-Brasstown complex, sandy loam	75	20 to 40 inches	Moderate	Severe	Moderately suited
JbF	Junaluska-Brasstown complex, sandy loam	235	20 to 40 inches	Severe	Severe	Poorly suited
MaE	Maymead, loam	9	> 60 inches	Moderate	Severe	Moderately suited
NoE	Northcove, stony sandy loam	16	> 60 inches	Moderate	Slight	Moderately suited
NoF	Northcove, stony sandy loam	45	> 60 inches	Severe	Slight	Poorly suited
NoG	Northcove, stony sandy loam	2	> 60 inches	V. Severe	Slight	Poorly suited
SoE	Soco, fine sandy loam	32	20 to 40 inches	Moderate	Moderate	Moderately Suited
SoF	Soco, fine sandy loam	25	20 to 40 inches	Severe	Moderate	Poorly suited
UcG	Unicoi-Rock outcrop complex, very cobbly sandy loam	31	7 to 20 inches	V. Severe	Moderate	Poorly suited
	Total Acres	660				

[1] The ratings are based on average conditions for the soil type and are not intended to describe localized variances that can occur. Soil data and descriptions were gathered from National Cooperative Soil Survey, Soil Data Mart queries. Acres provided are for the union of all stands proposed for commercial timber harvest under any alternative and were calculated using ArcMap version 10.1.

[2] C = 5-12% slope; D = 12-20% slope; E = 20-35% slope; F = 35-50% slope; G = 50-80% slope.

[3] *Erosion Hazard:* The ratings in this interpretation indicate the hazard of soil loss from off-road and off-trail areas after disturbance activities expose the soil surface. The ratings are based on slope and soil erosion factor K.

The ratings are both verbal and numerical. The hazard is described as "slight," "moderate," "severe," or "very severe." A rating of "slight" indicates that erosion is unlikely under ordinary climatic conditions; "moderate" indicates that some erosion is likely and that erosion-control measures may be needed; "severe" indicates that erosion is very likely and that erosion-control measures, including revegetation of bare areas, are advised; and "very severe" indicates that significant erosion is expected, loss of soil productivity and off-site damage are likely, and erosion-control measures are costly and generally impractical.

[4] *Rutting Hazards:* Ratings in this interpretation indicate the hazard of surface rut formation through the operation of forestland equipment. Soil displacement and puddling (soil deformation/compaction) may occur along with rutting. Ratings are based on depth to a water table, rock fragments on or below the surface, the Unified classification of the soil, depth to a restrictive layer, and slope. The hazard is described as slight, moderate, or severe. A rating of "slight" indicates that the soil is subject to little or no rutting. "Moderate" indicates that rutting is likely. "Severe" indicates that ruts form readily.

[5] *Harvest Equipment Operability:* Ratings indicate the suitability for use of forestland harvesting equipment. Ratings are based on slope, rock fragments on the surface, plasticity index, content of sand, the Unified classification of the soil, depth to a water table, and ponding. Standard rubber-tire skidders and bulldozers are assumed to be used for ground-based harvesting and transport.

Ratings are both verbal and numerical. Rating class terms indicate the degree to which the soils are suited to this aspect of forestland management. “Well suited” indicates that the soil has features that are favorable for the specified management aspects and has no limitations. Good performance can be expected, and little or no maintenance needed. “Moderately suited” indicates the soil has features that are moderately favorable for the specified management aspects. One or more soil properties are less than desirable, and fair performance can be expected. Some maintenance needed. “Poorly suited” indicates the soil has one or more soil properties unfavorable for the specified management aspect. Overcoming unfavorable properties requires special design, extra maintenance, and costly alteration.

Soils of Concern

Soils of concern in the Paint Creek project area include those with soil properties and/or behavior characteristics that require additional evaluation, investigation or project mitigations to minimize impacts that have the potential to degrade soil quality and productivity. A review of the soil

properties and interpretations presented above (Table 3b) and the spatial distribution of soils (Appendix F) identified three soil series as soils of concern. The Brasstown, Junaluska, and Northcove soil series have characteristics of concern for the proposed action and other action alternatives including shallow depth to bedrock, and the existence of surface stones or channers in the subsoil. Additionally, 46% of the analysis area is mapped as one of these soils of concern occurring on slopes greater than 35%. Soil scientists involved in the analysis of the project area identified 35% slopes as a recommended threshold for slopes at which issues with slope ~~in~~stability and erosion may begin to occur without proper mitigation. Map unit descriptions for analysis area soils and official NRCS soil series descriptions are on file in the project record.

Junaluska and Brasstown Soil Series

The Junaluska and Brasstown soil series are two soils that developed in metasedimentary geology in the area, which can contribute to several soil concerns. These soils formed in residuum that is affected by soil creep in the upper part of the soil profile, and is weathered from metasedimentary rocks including phyllite, slate, and metasandstone. Permeability is moderate in the Brasstown and Junaluska soils. Depth to weathered bedrock is 40 to 60 inches in the Brasstown series, and 20 to 40 inches in the Junaluska soils. Channer-size rock fragments (flat, 1-2 inches in length) up to 35% by volume can be found in the subsoil material of both soils. This volume of rock can impose challenges in soil and/or site management. Soil texture is sandy clay loam in the subsoil of Brasstown soils, sandy clay loam and fine sandy loam in Junaluska.

Within the project area stands, these two soil series are found in a map unit complex, comprised of 50% Junaluska and 40% Brasstown. The remaining 10% is composed of minor soils. The two soils cannot be mapped separately at the selected map scale of the soil survey. This composition presents challenges in predicting individual soil properties and behavior on the ground, therefore soils within the Brasstown-Junaluska complex need to be managed as a unit, based on the shallower depth to rock Junaluska series.

A primary management concern on these two soils is the potential for erosion from ground disturbance, particularly removal of protective vegetation cover. Pre-activity evaluations are recommended before access routes are constructed, along with timely attention to maintenance of mitigation measures designed in the ground disturbance areas. The location of access routes for skidding, log landings and haul roads needs to be identified prior to disturbance to minimize impacts to steep slopes, and install proper Best Management Practices to mitigate concerns of erosion, compaction or slope creep caused by operation activities.

Both of these soils have similar ratings for erosion hazard, rutting hazard and harvest equipment operability. The rutting hazard associated with these soils is severe for all slope classes, however rutting on skid roads and log landings can be mitigated through proper application of design criteria and BMPs. The rankings for erosion hazard and harvest equipment operability are strongly driven by slope (Table 3c).

Table 3c: Relationship of Soil Hazard Ranking to Slope for Junaluska and Brasstown Soils

Slope Class	Erosion Hazard, Off-Road Off-Trail	Harvest Equipment Operability
C (5%-12%)	Slight	Moderately Suited
D (12%-20%)	Moderate	Moderately Suited
E (20%-35%)	Moderate	Moderately Suited
F (35%-50%)	Severe	Poorly Suited
G (50%-80%)	Very Severe	Poorly Suited

USFS and NRCS personnel evaluated the stands identified for proposed timber harvest operations to identify stand areas of concern on slopes over 35%. Most of the damage to these soils can be minimized by not operating ground-based logging equipment on F or G slopes. Approximately 39% of the soils in the analysis area consist of Junaluska or Brasstown soil series mapped as occurring on F and G slopes. When avoidance is not an option, all bladed surfaces with a slope greater than 10% shall be mulched as well as seeded, in accordance with project-specific design criteria.

Northcove Series

The Northcove series consists of very deep, well drained, moderately rapidly permeable soils on benches, fans, and foot slopes in coves. They formed in colluvium derived from materials weathered from lowgrade metasedimentary rocks such as quartzite, phyllite, metasandstone, metagraywacke, and slate. Depth to weathered bedrock is greater than 60 inches. Rock fragment content in the subsoil horizons ranges from 35 to 60 percent by volume, with fragment size being channers, cobbles or gravels. This amount of rock fragment by volume presents challenges in soil/site management, particularly if excavation for operations is required. Approximately 7% of the soils in the analysis area are mapped as-Northcove soil series mapped occurring on F and G slopes. These soil types are composed of colluvial material which is susceptible to slippage and slumpage when disturbed.

The rankings for erosion hazard and harvest equipment operability are strongly driven by slope (Table 3d).

Table 3d: Relationship of Soil Hazard Ranking to Slope for Northcove Soils

Slope Class	Erosion Hazard, Off-Road Off-Trail	Harvest Equipment Operability
C (5%-12%)	Slight	Well Suited
D (12%-20%)	Slight	Well Suited
E (20%-35%)	Moderate	Moderately Suited
F (35%-50%)	Severe	Poorly Suited
G (50%-80%)	Very Severe	Poorly Suited

It thus follows that potential damage to these soils can be mitigated by minimizing ground-based operations on F or G slopes. Extra caution should be used when disturbing these soils. Proper location and adequate road drainage such as out sloping, cross drains, and/or rolling dips is important when building roads on these soil types when avoidance is not an option.

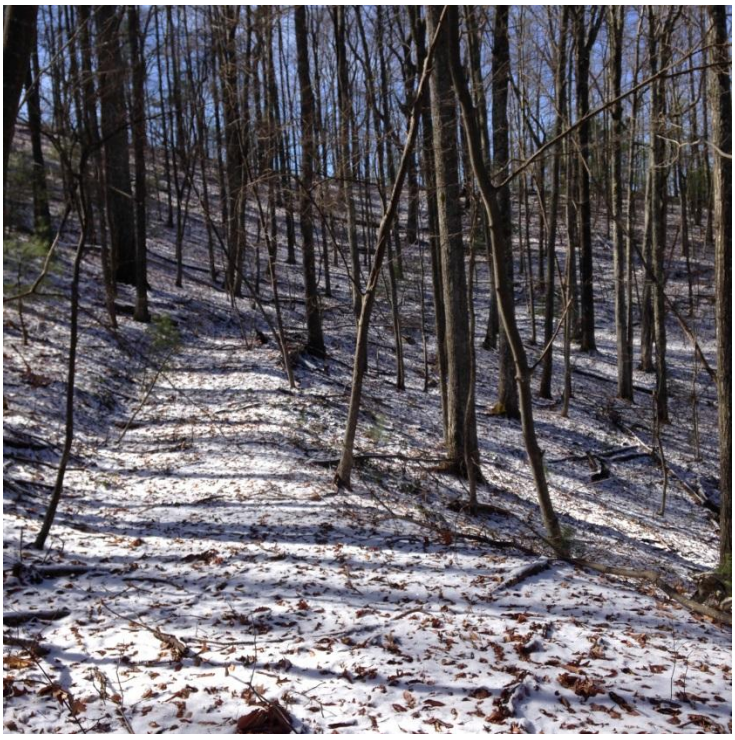
Steep Slopes

As discussed in the previous sections, approximately 46% of the analysis area is mapped on soils of concern on steep slopes (F and G slopes). This percentage indicated the need for a field evaluation to verify conditions on the ground and to assess the effects of previous management activities on similar terrain and soils. Over the course of 5 days during with winter of 2014-2015, all stands proposed for commercial treatment were visited by an interdisciplinary team consisting of a USFS timber manager, soil scientist and/or hydrologist. NRCS soil scientists also participated in the review of some stands. Due to time, weather, and access constraints, the areas visited within each stand were prioritized based on percent F and G slopes and soils of concern. For each stand, the team documented soil and slope conditions, clarified areas intended for equipment operation, and developed stand-specific design criteria/mitigations where necessary. A Supplemental Soils Investigation Report, completed in February 2015, documenting the methods and results of the field investigation is presented in Appendix F5.

Two previous Forest Service timber sales have occurred in the vicinity of the proposed Paint Creek project in the past 10 years. One closed in 2005 and the second one closed in 2009. These sales included areas mapped as Junaluska-Brasstown complex on “F” slopes. Both were evaluated as part of the field investigation described above. Disturbed areas such as log landings and skid roads were documented to be appropriately located, fully revegetated and stable (Figure 1). Skid road construction was minimized, located primarily on slopes less than 15 percent, along ridges and upper sideslopes. It was thus determined that standard design criteria and mitigations were effective in achieving the desired outcome and protecting soil resources. Additionally, many of the stands contained old skid roads that have vegetated and remained stable over time (Figure 2) It is therefore anticipated that erosion on access routes or landings can be successfully mitigated by proper implementation of BMPs and timber sale contract provisions.

Figure 1. Landing used for 2009 sale is stable and fully revegetated.

Figure 2. Old skid roads through 218/10 and other units are stable and generally run at appropriate grades, making them suitable for use in the proposed timber harvest.



In general, the recent field analysis of the proposed stands showed that many of the areas proposed for commercial timber harvest within the stands have slopes of lower gradient than the stands as a whole, and lesser slopes than the larger soil map units within which they are located. NRCS soil map units are delineated over an area larger than the scale at which the Forest Service generally manages. Consequently, there can be a range of slopes and topography within any given soil map unit. Thus, it is necessary to judge the hazards related to soil stability and productivity based on site-specific topography rather than on inclusion in a broad slope class or soil map unit (Figure 3). Also, areas with steep slopes would sometimes be excluded from the harvesting activities because they would be within the Streamside Management Zones (Figure 4).

Harvesting could be implemented in these stands without unacceptable effects by following the Cherokee National Forest Land and Resource Management Plan Standards and Guidelines. In stands where the forest plan standards and guidelines would not be sufficient, properly applying the recommended design criteria and/or mitigation measures (Appendix F5) would limit the effects from the harvesting activities. It should be noted that the design criteria listed in Appendix F5 are generally just a site-specific description of the application of standard design criteria. Only two stands (209/30 and 217/4) were determined to require a subsequent review during the layout phase due to the presence of soils of concern. It is anticipated, based on past performance and design criteria, that the return visit to those stands will reveal that sale layout is appropriate and that no site-specific mitigation measures are required. After field inspection, one stand (214/15) was recommended for conversion to non-commercial treatment as a result of the prevalence of extremely thin, rocky soils on steep slopes.

Figure 3. View east into 209/21 from northwestern corner of unit. Area mapped as Junaluska-Brasstown "F." Most of the area proposed for management actually has "D" and "E" slopes with intermittent "F". Note the lower gradient along the crest of the ridge in the background of the photo..

Figure 4. Equipment would be excluded from portions of the area of 218/10 mapped as Junaluska-Brasstown "F" that fall within the streamside management zone.

Effects Analysis of the Alternatives

Alternative A (No Action)

Direct and Indirect Effects

Under the No Action Alternative natural processes of soil weathering, and soil accumulation and erosion would continue. There would be no direct effects on soils from the proposed management activities. However, under this alternative, opportunities typically concomitant with timber harvest pre-haul road maintenance to correct or improve Forest Service system roads and/or road drainage problems that can lead to erosion and increased sedimentation would be missed, as would opportunities to restore rare communities currently being affected by soil movement. Standard scheduled road maintenance would continue, and may result in some soil disturbance. Maintenance activities, however, typically result in minimal soil loss and sedimentation potential.

Cumulative Effects

Alternative A would have no direct cumulative effects on soil resources within the cumulative effects analysis area since the proposed actions would not be implemented. Although scheduled Forest Service road maintenance would continue, the alternative would have an indirect cumulative effect when considered with anticipated reduced system road improvements in the future, and current soil erosion/sedimentation problems associated with county and private roads found within the cumulative effects analysis area.

Alternative B (Proposed Action)

Direct and Indirect Effects

Timber Harvesting

Alternative B proposes approximately 502 total acres (23 stands) of commercial timber harvest: 377 acres (17 stands) of shelterwood and 125 acres (six stands) of thinning. The proposed 701 total acres (34 stands) of noncommercial treatment—647 acres (32 stands) of crop tree and 27 acres (two stands) of thinning—would have little to no potential to affect soil resources, primarily due to the absence of heavy equipment associated with commercially-harvested stands. The logging method proposed is ground-based, (tractor skidding) with the potential to affect soils by creating skid trails and ruts where felled timber is cabled to a landing. This can result in soil compaction, erosion, reduced infiltration rates, and nutrient reduction resulting in reduced soil productivity, and increased sediment production. Research has shown that the application of Best Management Practices (BMPs) substantially reduces the impacts to physical resources (Anderson and Lockaby 2011). For example, Tennessee BMPs (TDA, Division of Forestry 2003) for forest management include practices for locating, constructing, and retiring forest (temporary) roads, provisions for proper drainage and erosion control measures, location and stabilization of log landings, location and design of skid trails, etc. This is not to say that soil compaction, erosion, etc., would not occur with the application of BMPs, but that any impacts would be greatly reduced with proper implementation.

Research (Dissmeyer and Stump 1978; Miller et al. 1986a), local experience, and field verification has shown that effects of timber harvest and associated site preparation on soil erosion rates are identifiable for up to three years, post-treatment. Timeframes for recovery of soil compaction and topsoil displacement vary, depending on soil type, slope, aspect, and other factors. Based on the acres of proposed commercial harvest, soil compaction and topsoil displacement may affect approximately 3.1% of the NFS land in the Paint Creek Watershed (502 acres/16,136 acres of NFS lands). This would meet Forest-wide Goal 8 which states that "[d]uring mechanical disturbance on all soils dedicated to growing forest vegetation, the organic layers, topsoil and root mat will be left in place over 85 percent of a project area" (USDA, Forest Service, 2004a, p. 24). While the Paint Creek Watershed is likely to be revisited within the next 10-15 years, any timber harvest proposed would not occur in the current project's proposed treatment areas.

The potential for surface erosion is also directly related to the amount of bare, compacted soil exposed to rainfall and runoff (Reid and Dunne 1984). In Alternative B, as well as other alternatives, bare and compacted soil is related to roads, trails, and landings. The areas associated with skid trails, landings and temporary roads would be directly affected; however, the limited spatial extent of the effects would result in negligible impacts to the soil health of the watershed as a whole. See *Roads* below for discussion of road impacts. In short, Tennessee State Best Management Practices and Forest Service Standards and Guidelines (USDA Forest Service 2004a) would be followed, as a minimum, to address soil concerns regarding road maintenance, temporary road construction and closure and landing placement and construction. Where Forest Service standards exceed BMPs, those standards shall take precedence.

Roads

A number of the roads on Forest Service land in the Paint Creek project area are presently closed**.** Under this alternative, the proposed 11.4 miles of pre-haul road maintenance and 0.1 miles of road reconstruction would result in some short-term soil erosion and sedimentation due to soil/roadbed disturbance from heavy equipment. However, the action would also provide opportunities to correct and/or improve approximately 11.5 miles of Forest Service system roads, thus reducing or eliminating problems that can lead to soil erosion and increased sedimentation over the long term.

There would be a potential for soil erosion, compaction, reduced infiltration rate, and sediment production from the proposed 0.3 miles of temporary road construction. Measures designed to stabilize the road surface during construction, such as adding aggregate surfacing, and the placement of water control measures, such as installing water diversion devices, would greatly reduce any adverse effects. Slopes outside the road surface would also be stabilized by seeding and/or mulching to minimize erosion. All temporary roads created for project operations would be closed and stabilized post-operation. Again, Tennessee State BMPs and Cherokee National Forest Standards would be applied during and after temporary road construction to reduce any impacts.

Approximately 8.3 miles of road would be authorized, i.e. added to the Forest's road system. These roads are currently in place, and were considered necessary for resource management

and/or public access, per the Paint Creek Travel Analysis Report. The roads would receive periodic maintenance to prevent/correct drainage or erosion problems, as needed.

Alternative B proposes to decommission approximately 3.7 miles of roads (2.8 miles of authorized roads and 0.9 miles of unauthorized roads) on National Forest System lands, per the Paint Creek Travel Analysis Report. This action would improve the condition of soil and water resources in the project area, especially in the vicinity of Meadow Ridge and Bellcow Mountain. Decommissioning 1.7 miles of FSR 422 (Shad Road) and 0.4 miles of FSR 422B would eliminate OHV use of the road, the current source of chronic soil disturbance, ameliorate existing compaction, reduce sedimentation into tributaries of Rough Branch, and potential hydrocarbon contamination. It would also remove the potential for new areas of soil disturbance to occur in the form of user-created trails. It should be noted that a short-term increase in soil erosion would result from construction work associated with decommissioning FSR 422 and 422B, areas of which would require drainage repair and, in some areas, recontouring to prevent future illegal access.

Herbicides

Under Alternative B, herbicides would be used to control woody vegetation and treat non-native invasive species (NNIS) on a total of 626 acres. Glyphosate, Imazapyr and Triclopyr would be used for pre- and post-harvest site treatments in the stands proposed for ESF creation (377 acres). Glyphosate and Imazapyr would be used for pre- and post-harvest site treatments in stands proposed for thinning (152 acres) and midstory treatment (95 acres). An aquatic-approved version of Glyphosate would also be used to control encroaching woody vegetation within and along the edges of Allen Gap Pond (two acres) to restore the wetland to a more open condition. Minimal amounts of chemical would come in contact with the soil since the herbicides would be applied on the leaf surface or would be directed into the vegetation. (See Appendix C–Herbicide Use Assumptions for herbicides to be used.)

Unless otherwise specified, the following information is from Syracuse Environmental Research Associates (SERA) Risk Reports for the specific herbicide used. Effects of the individual herbicides can be found below:

Glyphosate (Roundup) would have negligible to no impacts on soil resources. The herbicide is highly adsorbed by and tightly bound in most soils, especially those with a high organic content (SERA 2003a). This results in little transference of the herbicide by rain or other water sources from the point of soil contact. The herbicide is readily metabolized by soil bacteria, with many species of microorganisms using glyphosate as a carbon source (ibid).

Imazapyr is the common name for the active ingredient in Arsenal and Chopper. The herbicide is applied to foliage, freshly cut stumps, or applied to cuts made around the base of a tree. The EPA categorizes Imazapyr as practically non-toxic to mammals, birds, honeybees, fish, and aquatic invertebrates (SERA 2004). Since the herbicide does not bind to organic material in the soils (Malipudi et al. 1991), the impacts to soils and soil microorganisms would be negligible, if at all.

Triclopyr ester (Garlon 4), also a common herbicide used in forestry applications, poses a slightly greater risk to soil resources than the other two herbicides. The most common effect is

the inhibition of soil microorganism growth, with the degree of inhibition varying by species and herbicide concentration levels (SERA 2003b). Temporary shifts in the population structure of microbial soil communities could occur, again depending on species present (ibid). However, based on the concentrations of chemical typically used by the FS, the potential for substantial effects on soil function and soil microorganisms would be low. Compliance with Forestwide Standards for herbicide use would further reduce this potential.

Herbicide applications to control competing vegetation do not disturb the topsoil layer, do not create additional bare soil, and do not adversely affect watershed condition when used responsibly (Neary and Michael 1996). By utilizing herbicides as opposed to mechanical pre- and post-preparation methods, the organic matter is left in place, and off-site soil movement does not increase the loss of nutrients following harvest activities. Maxwell and Neary (1991) concluded that the impact of vegetation management techniques on erosion and sediment losses occurs in this order, herbicides < fire < mechanical.

Prescribed Burn

Approximately 1,955 acres (sum of four burning blocks) of low-intensity prescribed burning are proposed in this alternative. Prescribed fire generally affects soil erodibility if mineral soil is exposed. Soil exposure is expected on dozer or handlines constructed for control lines, however this would be mitigated with drainage controls and/or seeding. There would be little, if any, mineral soil exposure resulting from low intensity burning within the control lines. Reports show little to no erosion after light to moderate intensity fires in the southeastern United States (Swift et al. 1993). However, burns conducted in areas with previous soil disturbance, such as where skidding of logs has occurred, increases the probability of soil erosion after burning (ibid).

Effects to the organic layer and on soil organisms from burning depend greatly on heat penetration into the soil. Heat penetration depends upon duration of heating and soil moisture (ibid). Prescribed burns typically result in a mosaic pattern of burned/non-burned areas, as well as areas experiencing varying burn intensities. Where only surface material is burned, the duration of heating would tend to be very low due to rapid consumption. However, direct mortality to invertebrates/organisms typically found in this layer, such as nematodes, springtails, insect larvae, mollusks (snails and slugs), mites, woodlice, and millipedes, and fungi, would occur. Where larger fuels, such as dead and down logs and limbs, and areas of higher fuel concentrations occur within the burn area, the potential for greater heat intensity and duration could also result in direct mortality of vertebrate organisms, such as salamanders, small mammals, etc. However, soil moistures tend to be higher beneath larger fuels which may offer some measure of protection to these organisms. Additionally, these areas tend to be small and scattered across the burn landscape. The surrounding unburned areas and burned areas of low fire intensity allow soil organisms to rapidly move back into areas of higher heat intensity/duration after the fire. The Forest Service limits the effects to the soil resource by burning under prescriptions where the duff and humus soil layers can be protected. By burning within strict parameters and lighting ridges and upper slopes, the fire burns dryer sites and extinguishes in the moist streamside and bottomland areas.

Prescribed burns use existing roads and natural barriers (riparian areas, creeks, streams and rivers) as firelines, wherever possible. Constructed firelines, built by dozer or by hand, include

drainage features such as dips, lead-outs, or reverse grades at regular intervals, where needed, to reduce concentrated water flow, erosion, and sediment. Nonetheless, construction of dozer lines and/or hand lines would displace topsoil and reduce soil productivity locally. Hand lines would result in less soil impacts. Existing firelines used for previous burn operations generally need to be re-bladed prior to burning or otherwise treated during subsequent burning activities, which would also result in soil displacement. All firelines would be seeded following completion of the burn, in accordance with Forestwide Standard FW-88 (USDA Forest Service 2004a, p. 53). Dozer lines constructed using best management practices would persist as a source of accelerated erosion for three years, post construction, based on research on similarly constructed skid trails (Miller et al., 1986a; Dissmeyer and Stump, 1978), local experience, and field verification.

Wildlife Activities

Wildlife habitat improvements such as the placement of boxes for bats, birds and small mammals, and the creation of ruffed grouse drumming logs would have no impacts on soil resources. The construction of five waterholes would result in some minor soil disturbance; however, any changes in soil characteristics would be minimal given the small areas involved and locations on level terrain. Direct effects would be the removal of surface soil to create the waterholes; however, the exposed mineral soil would revegetate over time.

The two acres of noncommercial white pine/hardwood thinning and rhododendron removal proposed in the Allen Gap Pond area would have negligible to no impacts on soil resources since heavy equipment would not be used; the felled trees and rhododendron slash would be left on site. (Also see 'Herbicide' analysis above.)

Cumulative Effects

The Paint Creek Project's proposed vegetation management should not result in unacceptable cumulative effects to the soils resource. There are no vegetation management projects currently planned within the analysis area beyond the Paint Creek project. Other than 40 acres of thinning in the Rough Branch Area in 2004, there has been no timber harvesting within the Paint Creek cumulative effects analysis area in the last 10 years. Soils in the thinned stands have recovered, are stable and show no signs of chronic soil erosion or instability. In addition, all timber harvest activities (past, present and future) include implementing FS Standards and Guidelines and TN BMPs designed to reduce impacts to soils.

Regularly scheduled road maintenance along with the proposed pre-haul road maintenance would have a cumulative effect on soils, i.e. soil erosion and sedimentation, within the analysis area. The effects of the proposed addition of 8.3 miles of road to the FSR system, by virtue of their placement on the road maintenance schedule, would also be cumulative. However, the repairs to drainage structures and other road drainage improvements typically made during scheduled road maintenance would, when combined with similar activities associated with pre-haul road maintenance and road authorization, result in a beneficial cumulative impact to overall watershed health. Temporary road construction would also be cumulative with the above. However, with the application of Forest Service Standards and Guidelines and BMPs, the cumulative effects from the temporary road would be reduced. In addition, the temporary road would be closed and reseeded/revegetated, post harvest.

Approximately 5,283 acres of prescribed burning, spread across six burn blocks, and 254 acres of wildfire have occurred in the analysis area within the past 10 years. The most recent prescribed burns occurred in 2009. The approximately 1820-acre Bellcow Mountain burn is proposed to be implemented in 2014-2015. Alternative B's proposed 1,955 acres of prescribed burns in four burn blocks would be cumulative with the past and planned future burns. However, any cumulative effects would be minor since: 1) fireline construction has and would employ erosion control measures such as relatively permanent drainage dips, reverse grades, out-sloping and lead-off ditches along with other erosion control measures; 2) areas of previous soil disturbance, such as firelines, would have healed since the past burns were conducted/wildfires occurred; and 3) the organic layer and populations of soil organisms within the past burn areas would have recovered since the past burns were conducted/wildfires occurred.

Activities proposed for wildlife habitat improvement and herbicide use would have no cumulative effect to the soil resource. This is based on the low impact of the planned activities and the limited area that may be impacted.

Alternative C

Direct and Indirect Effects

Timber Harvesting

Alternative C proposes approximately 485 total acres (34 stands) of commercial timber harvest: 303 acres (20 stands) of shelterwood and 182 acres (14 stands) of thinning. The proposed 70 acres of noncommercial treatment—crop tree (49 acres: three stands) and thinning (21 acres: two stands)—would have little to no potential to affect soil resources, primarily due to the absence of heavy equipment associated with commercially-harvested stands. Potential impacts to soils from timber harvest in Alternative C would be slightly less than those for Alternative B, due to fewer acres receiving commercial treatments (485 acres vs. 502 acres, Alternative C and B respectively). However, the impacts would be spread out more across the landscape since the number of stands proposed to be commercially treated would increase under Alternative C (34 stands vs. 22 stands in Alternative B).

Roads

Alternative C proposes 17.1 miles of pre-haul road maintenance, 5.7 miles more than Alternative B, but the same 0.1 miles of road reconstruction and 0.3 miles of temporary road. The increase in maintenance mileage would result in more short-term soil disturbance but less chronic erosion, long term. Otherwise the direct and indirect effects of Alternative C would be similar those described in Alternative B.

Upper Rough Branch Road (FSR 93; total NFS length = approximately 3.9 miles) is a legacy road with multiple drainage/erosion issues and a native surface type. It receives heavy recreational use during winter months when soils are often saturated, which results in rutting that exacerbates existing erosion problems. Alternative C proposes to decommission approximately one mile of FSR 93 on NFS lands: an approximately 0.7-mile section beginning at the intersection of FSR 93 and TN Highway 70, and an approximately 0.3-mile section in the

vicinity of and bisecting Cutshall Bog. The 0.7-mile portion slated for decommissioning is currently impacting the Rough Branch Beaver Pond. An approximately one mile section of road would be constructed in the vicinity of Cutshall Bog; however, the new section would avoid/circumvent the Bog and its associated wetlands, tying in with FSR 93 to the north and west of the bog. The approximately 1.0 miles of new road would be in a location consistent with applicable standards, and comply with current FS design standards, the RLRMP and Tennessee BMPs. These actions are proposed with a specific objective of improving the condition of soil and water resources in the project area.

Decommissioning the 1.0 miles of road would entail blocking access, repairing existing erosion issues, installation of appropriate drainage features, and grading and recontouring of select areas. These activities would result in short-term soil disturbance, erosion, and sediment movement into nearby streams and wetlands. However, the use of Forest-wide Standards and BMPs would reduce the impacts. All recontoured sections of the road would be stabilized, seeded or mulched, then allowed to naturalize. Eliminating the current source of chronic disturbance, compaction, erosion, and potential hydrocarbon contamination would improve the condition of the soil resource in the long term. The action would also remove a source of sedimentation into the aforementioned wetlands, Rough Branch and subsequently Paint Creek. Removal of the road segment (and the associated limestone rip-rap) crossing Cutshall Bog would restore a natural flow regime and pH to the bog, resulting in the restoration of wetland soils.

Overall, the roads activities proposed under Alternative C would have greater benefits to the soil resource than Alternative B.

Herbicides

Under Alternative C, herbicides would be used to control woody vegetation and NNIS on a total of 615 acres: 303 acres of ESF creation—74 fewer acres than Alternative B. Alternative C proposes 203 acres of thinning and 84 acres of midstory treatment—51 acres more and 11 acres fewer, respectively, than Alternative B. An aquatic-approved version of Glyphosate would be used to treat encroaching woody vegetation within and along the edges of Allen Gap Pond (two acres) and Cutshall Bog (23 acres) to restore both to more open conditions. (See Appendix C–Herbicide Use Assumptions for herbicide to be used.)

Although fewer total acres would be treated with herbicides under this alternative than in Alternative B, the difference is nominal (615 acres vs. 626 acres, Alternative C and B respectively). Potential effects associated with the use of herbicides for Alternative C would therefore be the same as those described in Alternative B. However, the impacts would be more spread out across the landscape since the number of stands proposed to be treated would increase under Alternative C (37 stands vs. 24 stands under Alternative B).

Prescribed Burn

The acres and the effects of prescribed burning on the soil resource proposed under Alternative C would be the same as those in Alternative B.

Wildlife Activities

In addition to the actions in Alternative B, wildlife habitat improvement activities proposed in Alternative C include restoration work in Cutshall Bog. Effects of the proposed road decommissioning and herbicide use in Cutshall Bog are discussed under the *Roads* and *Herbicides* sections above. The only action not previously addressed is restoring the connectivity between the channel and the floodplain (post road and associated limestone rip-rap removal). This action would disperse the sediment accumulating in the bog upstream of the road, improving the condition of the wetland soils.

Cumulative Effects

With the exception of decommissioning portions of Upper Rough Branch Road (FSR 93) and the restoration work in Cutshall Bog, the cumulative effects from Alternative C on soil resources would be similar to those discussed under Alternative B. The addition of the bog restoration work under Alternative C would have a beneficial cumulative effect on the soil resource.

Alternative D

Direct and Indirect Effects

Timber Harvesting

Alternative D proposes approximately 623 total acres (27 stands) of commercial timber harvest. The proposed 701 acres of noncommercial treatment—crop tree (674 acres: 32 stands) and thinning (27 acres: 2 stands)—would have little to no potential to affect soil resources, primarily due to the absence of heavy equipment associated with commercially-harvested stands. Potential impacts to soils from commercial timber harvesting in Alternative D would the same as those discussed for Alternative B, but with the inclusion of Group Selection in the Devil's Kitchen area, any impacts would occur over a larger area (Alternative B: 502 acres of commercial harvest in 22 stands). However, despite the increase in NFS lands being affected, Forestwide Goal 8 (see USDA, Forest Service, 2004a, p. 24) regarding mechanical disturbance of soils in forested areas would still be met under Alternative D.

Tennessee BMPs and Forestwide Standards designed to minimize impacts to soil resources would also apply to this alternative.

Roads

Alternative D proposes 4.8 more miles of pre-haul road maintenance than Alternative B (16.2 vs. 11.4, respectively) and 0.9 less miles than Alternative C (16.2 vs. 17.1, respectively). The variation in mileage would result in more short-term soil disturbance over a larger area under Alternative D than Alternative B, but slightly less than Alternative C. Correspondingly, Alternative D would provide more opportunities than either alternative, to reduce or eliminate problems that can lead to soil erosion and increased sedimentation over the long term.

The 0.1 miles of road reconstruction and 0.3 miles of temporary road construction under Alternative D would be the same and would have the same effects as Alternatives B and C.

Alternative D proposes to decommission the same roads and mileages as Alternative C, which is of greater scale than proposed under Alternative B. The effects on soil resources from road decommissioning would be the same as those discussed in Alternative C, but more than Alternative B.

Overall, implementation of the roads activities under Alternative D would be of greater benefit to the soil resource than Alternative B and approximately equal to Alternative C.

Herbicides

Alternative D proposes 1,099 acres of herbicide treatments: 398 acres of ESF creation (17 stands); 152 acres (eight stands) of thinning; 513 acres (15 stands) of midstory treatment; and 36 acres of wetland restoration which includes the Devil's Kitchen Bog (nine acres) and Rough Branch Beaver Pond (two acres). Although the group selection and thinning treatments are similar, group selection does not include pre- and post-harvest site preparation. Potential effects associated with herbicide use for Alternative D would be the same as those described in Alternative B, but more distributed and more evident, in the short term, across the landscape. As in Alternatives B and C, the impacts to soils would be minimal, if at all.

Prescribed Burn

The acres and the effects of prescribed burning proposed under Alternative D would be the same as those in Alternatives B and C.

Wildlife Activities

In addition those proposed in Alternative C, wildlife habitat improvements proposed in Alternative D include the following:

- Noncommercial thinning and herbicide use in Devil's Kitchen Bog (nine acres), and
- Noncommercial thinning and herbicide use in Rough Branch Beaver Pond (two acres).

Direct and indirect effects of wildlife habitat improvements proposed in Alternative D, including the restoration work in Devil's Kitchen Bog and the Rough Branch Beaver Pond, would be the same as those in Alternatives B and C.

Cumulative Effects

Due to the increased commercial harvest treatment area, the cumulative effects on the soil resource associated with implementation of Alternative D would be greater than Alternatives B and C. However, at the scale of the project area, the contribution of cumulative impacts by the Alternative D would not be significant on soil productivity or the soil resource. Forest Service activities would meet standards for maintaining soil productivity through proper implementation of management requirements and the prescribed design criteria.

Water

Affected Environment

Most areas proposed for management are in the Paint Creek 6th level Watershed (Hydrologic Unit Code: 060101051401) which covers approximately 16,000 acres. The Paint Creek watershed is part of the French Broad River 5th level Watershed (0601010514). A portion of the management in the Devil's Kitchen area is in the Cove Creek 6th level Watershed (060101080704), which is in the Cove Creek – Nolichucky River 5th level Watershed (0601010807). Table 3e presents the designated uses of waterbodies in or immediately downstream from the analysis area (from TDEC 2013a).

Table 3e: Use Classifications for Surface Waters

Stream	Description	DOM	IWS	FAL	REC	LWW	IRR	NAV	TS	NRTS
French Broad River	Mile 0.00 to 102.2 (N.C.-TN Line)	X	X	X	X	X	X			
Paint Creek	0.0 to Origin			X	X	X	X			X
All other surface waters named and unnamed in the French Broad River Basin, with the exception of wet weather conveyances, which have not been specifically noted shall be classified				X	X	X	X			
Nolichucky River	Mile 7.7 to 100.8 (NC-TN Line)	X	X	X	X	X	X			
Cove Creek	0.0 to Origin			X	X	X	X			

DOM - Domestic Water Supply
IWS - Industrial Water Supply
FAL - Fish and Aquatic Life
REC - Recreation
LWW - Livestock Watering and Wildlife
IRR - Irrigation
NAV - Navigation
TS - Trout Stream
NRTS - Naturally Reproducing Trout Stream

All waters within the Cherokee National Forest are classified as Exceptional Tennessee Waters (TDEC 2013b), consequently no degradation that threatens the designated uses of these waters is permitted. The TDEC Stream/Waterbody Assessments revealed that neither Paint Creek nor any of its tributary streams were assessed in 2013, and it is unknown whether they are supporting their designated uses. However, the water quality in Paint Creek is assumed to be excellent due to the high percentage of forested land in its watershed (89% FS ownership plus some forested

private land). The French Broad River downstream of the confluence with Paint Creek was categorized as fully supporting its designated uses (TDEC 2013c).The TDEC Assessments show that Cove Creek and its tributaries are fully supporting their designated uses, with the exception of Cedar Creek which is impaired by sediment/siltation resulting from grazing in the riparian zone downstream of the Forest Boundary. The Nolichucky River is also listed as impaired by sedimentation/siltation resulting from both grazing in the riparian zone and upstream sources outside the state.

Water quality on National Forest System land is generally good as a result of forest cover, maintenance of road systems, and, where past management activities have occurred, the implementation of Forestwide Standards and Guidelines and Tennessee Best Management Practices.

The project area has a dendritic drainage pattern. Landforms of the area are primarily characterized by steep, dissected mountains and narrow V-shaped valleys draining into progressively wider and less steep alluvial valleys. Streams common to these landforms are categorized by Rosgen (2012) as "A" and "B" types: generally high energy but stable with a low sediment supply due to their "bouldery" composition. "C" type streams (Rosgen 1996) occur where valley bottoms are wider due to the deposition of alluvial materials over time. "C" type streams on the Cherokee National Forest are often naturally unstable due to a continuous supply of large woody debris to the channel. This is not the case with Paint Creek, however, where the functionality of the floodplain is compromised by a road and associated recreational facilities in close proximity to the creek for most of its length. Additionally, much of the Paint Creek floodplain in the upper half of the watershed is private property used for grazing and consequently does not have a natural, forested riparian buffer to provide shade or woody debris to the stream. Numerous rock vanes, gabion basket walls, and other stream structures were constructed by NRCS in portions of the stream channel adjacent to private property as part of restoration efforts following the flood of 1994. These structures function well at preventing bank erosion but do not provide natural habitat for aquatic organisms.

The Paint Creek analysis area includes three wetlands that are currently impacted by sediment and/or habitat fragmentation associated with forest roads; Cutshall Bog, Devil's Kitchen Bog and Rough Branch Beaver Pond. Cutshall Bog is bisected by FSR 93 via a crossing constructed of fill material and limestone rip-rap. The crossing causes the up-gradient side of the bog to hold excess water while the down-gradient side of the bog becomes progressively drier allowing woody vegetation to encroach into the bog/wetland. Road sediment is visibly washing into the bog from the crossing and the approaches to it. In addition, the limestone rip-rap is impacting the biotic community by increasing the water's pH, which is ordinarily naturally acidic (low pH).

The National Wetlands Inventory (NWI) identifies one Freshwater Forested/Shrub Wetland adjacent to Paint Creek approximately 0.25 miles upstream of the junction with the French Broad River. The NWI also identifies multiple freshwater ponds on private land in the watershed. Multiple small wetlands are likely present at seeps and adjacent to streams in the analysis area.

Scope of Analysis

Unless otherwise stated, the scope of analysis for direct and indirect effects to Water Resources are National Forest System lands in the Paint Creek Watershed. Cumulative effects includes private lands within the watershed. The cumulative effects analysis will consider activities that have occurred in the past 10 years since sediment delivered to the stream should work its way through the system within this timeframe. Cumulative effects will also consider future activities in the next five years since this timeframe roughly coincides with USFS out-year planning.

Effects Analysis of the Alternatives

Alternative A (No Action)

Direct and Indirect Effects

The No Action Alternative would have no direct effects to stream systems since the proposed management activities would not occur at this time. Timber management, however, often provides a means to improve roads, stream crossings, and drainage systems. Under this alternative opportunities may be missed to correct or reduce problems that can lead to increased sedimentation in streams and wetlands. Regularly scheduled road maintenance and other activities such as recreation would continue on National Forest System lands. Rainfall events and natural erosion processes would continue to influence stream systems within the project area.

Cumulative Effects

Alternative A would have no direct cumulative effects on water resources within the cumulative effects analysis area since the proposed actions would not be implemented. Although current Forest Service road maintenance would continue, the alternative would have an indirect cumulative effect associated with reduced system road improvements anticipated in the future, and current soil erosion/sedimentation problems from county and private roads.

Alternative B (Proposed Action)

Direct and Indirect Effects

Timber Harvesting

Alternative B proposes 502 acres (22 stands) of commercial timber harvest, which is approximately 3.5% of the NFS land in the watershed area. There is always a risk of sedimentation of streams and riparian areas from activities associated with commercially-harvested stands. Noncommercially harvested stands have a low risk of sedimentation since equipment associated with commercial timber harvest (e.g. skidders) would not be used; skid trails, landings, etc. would not be present; and temporary roads would not be needed. Research (Anderson and Lockaby 2011), experience, and field verification confirm that Tennessee Best Management Practices are effective in preventing sedimentation. BMPs and Forestwide Standards would be implemented for all timber harvest activities. In addition, all streams and riparian areas adjacent to proposed treatment stands (including noncommercially-harvested stands) would be buffered according to Forestwide Standards.

Research has also shown that impacts of timber harvesting on sediment yield are directly related to skid trail layout and road building, as well as maintenance activities on access roads used for removing timber. When roads and skid trails are properly constructed and maintained [per TN BMPs and Forest Standards] there is generally minimal impact on stream sedimentation (Anderson and Lockaby 2011). See *Roads* below for discussion of road impacts.

Given the limited amount of the total NFS land in the watershed area affected (approximately 3.5%), and the implementation of Tennessee BMPs and RLRMP Standards, little to no effects on stream flow or water yield should occur. Buffering the streams (per the RLRMP) would ensure that stream temperatures would not be affected.

Roads

Although road systems are the chief cause and contributor of sediment to streams in a forested environment there should be no measureable impacts to any of the stream systems from the road activities proposed in Alternative B. While some drainage density increase, soil erosion, and sediment production from the proposed 0.3 miles of temporary roads would occur, measures designed to stabilize the road surface during construction, such as adding aggregate surfacing, installing water diversion devices, and the application of other Tennessee BMPs and Forestwide Standards to control erosion and sedimentation would reduce any impacts to stream systems.

Many of the roads on Forest Service land in the project area are presently closed**.** Under this alternative, the proposed pre-haul road maintenance and reconstruction would result in some soil erosion and sedimentation. However, the action would also provide the opportunity to correct or improve drainage on approximately 11.6 miles of Forest Service system roads, thus reducing or eliminating problems that can lead to erosion and increased sedimentation.

Other potential risks and sources of sedimentation come from stream crossings. Again, the use of BMPs have been shown to be effective in preventing sedimentation at stream crossings (Reidel et. al. 2004). The temporary road accessing Compartment 215, Stand 47 would not cross any streams. Approximately 8.3 miles of road would be authorized and included in the forest road system. These roads are currently in place, and would receive maintenance to prevent/correct drainage or erosion problems, as needed. Where steep mountain streams occur, pre-haul maintenance and the adoption of BMPs can facilitate stream restoration, e.g. the reduction of road sediment yield would allow streams to flush previously deposited road sand and fine gravel (ibid). Log landings, typically located on roads (or ridge tops), would not be located near streams or riparian areas and would not generate any direct or indirect effects.

Alternative B proposes to decommission approximately 3.7 miles of roads on National Forest System lands. This action was proposed with the specific objective of improving the condition of soil and water resources in the project area, especially in the vicinity of Meadow Ridge and Bellcow Mountain. Decommissioning the FSR 422 (Shad Road) and FSR 422B would eliminate OHV use of the road, the current source of chronic soil disturbance, sedimentation into tributaries of Rough Branch, and potential hydrocarbon contamination. It would also remove the potential for new areas of soil disturbance and sediment production to occur in the form of user-created trails. It should be noted that a short term increase in erosion is likely to result from

construction work associated with decommissioning of FSR 422 and 422B, areas of which require drainage repair and in some cases recontouring to prevent future illegal access.

Herbicides

Under Alternative B, herbicides would be used to control woody vegetation and treat non-native invasive species (NNIS) on a total of 626 acres. Glyphosate, Imazapyr, and Triclopyr would be used for both pre- and post-harvest site treatments in all stands proposed for ESF creation (377 acres). Imazapyr and Glyphosate would be used for both pre- and post-harvest site treatments in stands proposed for thinning (152 acres) and midstory treatment (95 acres). Glyphosate would also be used to treat approximately two acres of encroaching woody vegetation within and along the edges of Allen Gap Pond, thereby restoring it to a more open condition. Minimal amounts of chemical would be transmitted to surface waters as these herbicides would be applied on the leaf surface or directed into the vegetation. Timing of application and quantities applied would ensure that no measurable effects to water quality would occur even in aquatic scenarios. (See Appendix C– Herbicide Use Assumptions for herbicide to be used.) Overall, the action would have negligible effects on water resources.

Unless otherwise specified, the following information is from Syracuse Environmental Research Associates (SERA) Risk Reports for the specific herbicide used. Effects of the individual herbicides can be found below:

Glyphosate (Roundup) would have minimal to no impacts on water resources. The herbicide is highly adsorbed by and tightly bound in most soils especially those with high organic content. This results in little transference of the herbicide by rain or other water sources from the point of soil contact. The herbicide is readily metabolized by soil bacteria, and when present in water by aquatic microorganisms. Many species of microorganisms can use glyphosate as a carbon source.

Imazapyr is the common name for the active ingredient in Arsenal and Chopper. The herbicide is applied to foliage, freshly cut stumps, or applied to cuts made around the base of a tree. The EPA categorizes Imazapyr as practically non-toxic to mammals, birds, honeybees, fish, and aquatic invertebrates (SERA 2004).

Triclopyr ester (Garlon 4), also a common herbicide used in forestry applications, poses a slightly greater risk to fish and aquatic invertebrates than the other two herbicides. However, in a review of studies looking at the stream flow fate of triclopyr, the highest water concentrations of the herbicide in streams are found where buffer strips are not utilized. When buffer strips are employed, as they would be for the Paint Creek project, peak concentrations of the chemical have not been found to exceed action levels. Compliance with Forestwide Standards for herbicides would minimize herbicide effects on surface water

Where buffer strips are used and/or other mitigation measures are employed, herbicides used in forestry management generally do not pose a threat to water quality. The small quantity of herbicide used and the application method and strict handling standards, when combined with streamside management zones, would insure that no measurable direct or indirect effects would occur from proposed herbicide treatments in the project area.

Prescribed Fire

Approximately 1,955 acres (four blocks) of prescribed burning are proposed in this alternative. Fire generally affects soil erodibility, if mineral soil is exposed (see below). Other than where dozer-created or handline-created fireline occur, there would be little, if any, mineral soil exposure from the low intensity burns. Reports show little to no erosion (which can lead sediment movement into rivers and streams) after light to moderate intensity fires in the southeastern United States (Swift et al. 1993). However, burns conducted in areas with previous soil disturbance, such as where skidding of logs has occurred, increases the probability of soil erosion (and sedimentation) after burning (ibid). All dozer line locations have been determined to be in compliance with relevant Forest Standards.

Blading or plowing a fireline by using a dozer exposes mineral soil by removing vegetation, leaf litter and duff, thereby increasing the exposed areas' susceptibility to soil erosion and displacement of nutrients and organic matter offsite. Firelines can recover quickly, however, through revegetation efforts, post burn, and as they accumulate litter from the forest canopy. Erosion control measures, such as relatively permanent drainage dips, reverse grades, out-sloping and lead-off ditches, would be constructed along firelines to concentrate and redirect water flow and soil erosion. Thus, the effects of firelines on sediment delivery would be minimized.

Streamside areas would be marginally impacted by the proposed burns since timber harvest would not occur in riparian corridors and therefore logging slash would not exist. The burns would be allowed to back down into streamside areas, but fire typically does not carry far into these moister/damper areas. In addition, Forestwide Standards prohibit placing firelines in or adjacent to perennial, intermittent, or ephemeral streams (see UDSA Forest Service 2004a, FW-18 and 19, p. 27). All handlines must be constructed to run perpendicular to a stream course, resulting in less exposed mineral soil. Finally, since little vegetation mortality occurs in riparian areas from low-intensity burns, the vegetation within these areas would help trap and filter out sediment before runoff entered a stream.

Wildlife Activities

Direct and indirect effects to water resources from the proposed wildlife habitat improvements would be similar to those described in the Alternative B soils analysis above. Effects from the construction of five water holes would be the capture and retention of water in the localized area; however, any impacts would be negligible given the small areas involved and their locations on level terrain.

Cumulative Effects

The Paint Creek project would not result in any measurable cumulative effects to water resources, i.e. streams or riparian areas, within the cumulative effects analysis area. With the exception of 40 acres of thinning in the Rough Branch area in 2004, no commercial timber harvesting has occurred within the analysis area in the last 10 years. Additionally, when management activities are properly designed and appropriate design criteria (i.e. BMPs and Forestwide Standards) are implemented, watersheds typically recover within 2-5 years post-harvest. Other proposed activities, e.g., noncommercial timber harvest, herbicide use, prescribed

burning, wildlife habitat improvements, and road decommissioning would have no unacceptable cumulative effects to water resources.

Activities on private land beyond the forest service boundary would be expected to continue in the future. These activities, as described in the no action alternative, are typical community activities that involve road construction, structures, pastures, stream crossings, farming and timber harvesting. These activities would continue to impact water resources and add, cumulatively, to any impacts from Alternative B.

Alternative C

Direct and Indirect Effects

Timber Harvesting

Alternative C proposes 485 acres (36 stands) of commercial timber harvest, which equals approximately 3.4% of the FS land in the watershed area. As in Alternative B, the noncommercial treatments proposed under Alternative C (70 acres in five stands) would result in no soil erosion or sedimentation. Potential impacts to water resources from timber harvest in Alternative C would be slightly less than those for Alternative B, due to fewer acres receiving commercial treatments (485 acres vs. 502 acres, Alternative C and B respectively). However, the impacts would be spread out more across the landscape since the number of stands proposed to be commercially treated would increase under Alternative C (34 stands vs. 22 stands in Alternative B).

RLRMP Standards and Guides and Tennessee BMPs designed to minimize long-term impacts would be applied during all phases of commercial and noncommercial timber harvest.

Roads

Alternative C proposes 17.1 miles of pre-haul road maintenance, 5.7 miles more than Alternative B, and the same 0.1 miles of road reconstruction and 0.3 miles of temporary road. The increase in maintenance mileage would result in more short-term soil disturbance but a reduction in long term erosion and sedimentation rates, long term. Otherwise the direct and indirect effects of Alternative C would be similar those described in Alternative B.

Upper Rough Branch Road (FSR 93; total NFS length = approximately 3.9 miles) receives heavy recreational use during the winter months when soils are often saturated. This results in rutting that exacerbates existing soil erosion and drainage problems, and accelerates sediment delivery. In addition to the 3.7 miles proposed to be decommissioned under Alternative B, Alternative C proposes to decommission approximately one mile of FSR 93: an approximately 0.7-mile section beginning at the intersection of FSR 93 and TN Highway 70, and an approximately 0.3-mile section in the vicinity of and bisecting the Cutshall Bog rare community. The 0.7-mile segment is currently impacting the Rough Branch Beaver Pond. An approximately one mile section of road would be constructed in the vicinity of Cutshall Bog; however, the new section would avoid/circumvent the Bog and its associated wetlands, tying in with FSR 93 to the north and west of the Bog. The new road would comply with current FS design standards, the RLRMP and

Tennessee BMPs. The actions are proposed with the specific objective of improving the condition of soil and water resources in the project area.

Decommissioning the two segments of FSR 93 would entail blocking access, repairing existing erosion issues, the installation of appropriate drainage features, and grading and recontouring of select areas. These activities would result in short-term soil disturbance, erosion, and sediment movement into nearby streams and wetlands. However, sediment delivery rates would decrease over the long term. The use of Forest-wide Standards and BMPs would reduce any impacts. All recontoured sections of the road would be stabilized, seeded or mulched, then allowed to naturalize. This action is specifically intended to:

1. Reduce sediment delivery to Cutshall Bog, Upper Rough Branch Beaver Pond, Rough Branch, and subsequently Paint Creek;
2. Restore the hydrology and drainage density of the subwatershed to a more natural condition where the road has captured either a stream or overland flow; and
3. Restore a natural flow regime and pH to Cutshall bog via removal of the crossing (and associated limestone rip-rap).

Methods used to rehabilitate the road may result in a short term increase in sediment delivery associated with soil disturbance, however long term sediment delivery rates would decrease.

Discontinuation of vehicular access to the road would remove the existing source of chronic sedimentation and potential hydrocarbon contamination of water resources in the area in the long term. The removal of vehicular traffic in combination with implementation of drainage repairs and recontouring of select areas would move the hydrology of the riparian area towards a more natural state. It would also remove the potential for new areas of hydrologic disturbance to occur in the form of user-created trails on land and in the stream itself.

Despite the greater area of soil disturbance associated with new construction under this alternative and the associated short-term increase in sediment production, implementation of the roads activities under Alternative C would be of greater benefit to the water resource than Alternative B in the long term.

Herbicides

Under Alternative C, herbicides would be used to control woody vegetation and NNIS on a total of 615 acres: 303 acres of ESF creation—74 fewer acres than Alternative B. Alternative C proposes 203 acres of thinning and 84 acres of midstory treatment—51 acres more and 11 acres fewer, respectively, than Alternative B. An aquatic-approved version of Glyphosate would be used to treat encroaching woody vegetation within and along the edges of Allen Gap Pond (two acres) and Cutshall Bog (23 acres) to restore both to more open conditions. Timing of application and quantities applied would ensure that no measurable effects to water quality would occur in aquatic scenarios. (See Appendix C–Herbicide Use Assumptions for herbicide to be used.)

Although fewer total acres would be treated with herbicides under this alternative than in Alternative B, the difference is nominal (615 acres vs. 626 acres, Alternative C and B respectively). Potential effects associated with the use of herbicides for Alternative C would therefore be the same as those

described in Alternative B. However, any impacts would be spread out more across the landscape since the number of stands proposed to be treated would increase under Alternative C (37 stands vs. 24 stands under Alternative B). Overall, the impacts to water resources would be negligible, if at all

Prescribed Fire

The acres and the effects of prescribed burning on water resources proposed under Alternative C would be the same as those in Alternative B.

Wildlife Activities

The effects of wildlife habitat improvements on water resources under Alternative C would be similar to those discussed in Alternative B. Additional wildlife habitat improvements proposed in Alternative C include restoration work in Cutshall Bog.

Effects of the proposed road decommissioning and herbicide use in Cutshall Bog are discussed under the *Roads* and *Herbicides* sections above. The only action not previously addressed is restoring the connectivity between the channel and the floodplain (post road and associated limestone rip-rap removal). This action would disperse the sediment accumulating in the bog upstream of the road, improving the condition of the wetlands.

Cumulative Effects

With the exception of the decommissioning of portions of Upper Rough Branch Road (FSR 93) and the restoration work in Cutshall Bog, the cumulative effects from Alternative C on water resources would be similar to those discussed under Alternative B. The addition of the Bog restoration work under Alternative C would result in a beneficial cumulative effect to the water resource.

Alternative D

Direct and Indirect Effects

Timber Harvesting

Alternative D proposes approximately 623 total acres (27 stands) of commercial timber harvest which equals approximately 4.4% of the FS land in the watershed area. The proposed 701 acres of noncommercial treatment—crop tree (674 acres: 32 stands) and thinning (27 acres: 2 stands)—would have little to no potential to affect water resources, primarily due to the absence of heavy equipment associated with commercially-harvested stands. Potential impacts to water resources from commercial timber harvest in Alternative D would the same as those discussed for Alternative B, but with the inclusion of Group Selection in the Devil's Kitchen area, any impacts would occur over a larger area (Alternative B proposes 502 acres of commercial harvest in 24 stands). However, despite the increase in acreage and number of stands to be treated, Forestwide Goal 8 (see USDA, Forest Service, 2004a, p. 24) would still be met since the amount of affected NFS land under Alternative D would increase by less than 1%.

Tennessee BMPs and Forestwide Standards designed to minimize impacts to soil resources would also apply to this alternative.

Roads

Alternative D proposes 4.8 miles more pre-haul maintenance than Alternative B (16.2 miles vs. 11.4 miles), 0.9 miles less than Alternative C (16.2 miles vs. 17.1 miles), and the same 0.1 miles of reconstruction and 0.3 miles of temporary road construction as both Alternatives B and C. The variation in pre-haul mileage would result in slightly more short-term soil disturbance under Alternative D than Alternative B and slightly less than Alternative C. Correspondingly, implementation of Alternative D would result in a greater reduction in long term sediment delivery rates than Alternative B and a lesser reduction than Alternative C.

Alternative D proposes the same road decommissioning as Alternative C, which is of greater scale than the road decommissioning proposed under Alternative B. Thus the benefit to the water resource associated with implementation of Alternative D would be equal to Alternative C and greater than Alternative B.

Overall, implementation of the roads activities under Alternative D would be of greater benefit to the water resource than Alternative B and approximately equal to Alternative C.

Herbicides

Under Alternative D, Imazapyr, Glyphosate and Triclopyr would be used for both pre- and post-harvest site treatments in all stands proposed for ESH creation (395 acres – 18 more acres than Alternative B and 92 more acres than Alternative C). Imazapyr and Glyphosate would be used for both pre- and post-harvest site treatments in stands proposed for thinning (152 acres – the same as Alternative B and 51 fewer acres than Alternative C) and for midstory treatments (513 acres – 418 acres more than Alternative B and 429 more than Alternative C). Restoration applications of Glyphosate would also be the same as Alternative C with the following additions:

- Nine acres of treatment in and around Devil's Kitchen Bog; and
- Two acres in and around Rough Branch Beaver Pond.

Minimal amounts of chemical would be transmitted to surface waters as most are applied on the leaf surface or directed into the vegetation. Timing of application and quantities applied would ensure that no measurable effects to water quality would occur even in aquatic scenarios. (See Appendix C–Herbicide Use Assumptions for amount of herbicide to be used.) Potential effects associated with the use of these herbicides would be the same as those described in Alternatives B and C. As in Alternatives B and C, the impacts to water resources would be minimal, if at all.

Prescribed Fire

Same as Alternatives B and C.

Wildlife Activities

In addition those proposed in Alternative C, wildlife habitat improvements proposed in Alternative D include the following:

- Noncommercial thinning and herbicide use in Devil's Kitchen Bog (nine acres), and
- Noncommercial thinning and herbicide use in Rough Branch Beaver Pond (two acres).

Direct and indirect effects of wildlife habitat improvements proposed in Alternative D, including the restoration work in Devil's Kitchen Bog and the Rough Branch Beaver Pond, would be the same as those in Alternatives B and C.

Cumulative Effects

Due to the increased commercial harvest treatment area, the cumulative effects on the water resource associated with implementation of Alternative D would be greater than Alternatives B and C.

Executive Orders 11988 (Floodplains) and 11990 (Wetlands)

The objective of EO 11988 is to avoid, to the extent possible, long- and short-term adverse impacts associated with the occupancy and modification of floodplains and to avoid direct or indirect support of floodplain development wherever there is a practicable alternative. Based on a review of detailed Forest-level NRCS soil mapping (2013b) and FEMA Flood Maps (2012), there are no floodplains present in the project area. All alternatives are consistent with Executive Order 11988.

EO 11990 requires the Forest Service to take action to minimize the destruction, loss, or degradation of wetlands, and to preserve the natural and beneficial values of wetlands. Based on a review of National Wetlands Inventory data (2013) and detailed Forest-level soil survey information (NRCS 2013b), there are no wetlands present in the project area. All alternatives are consistent with Executive Order 11990.

Forest Resources

Affected Environment

All acreages are from the Cherokee National Forest's Geographical Information System (GIS). Age class tables used 2013 as the base year. There may be some minor discrepancies when comparing total acres and percentages due to rounding.

The Paint Creek Project area's forested acres have a dominant cover of deciduous species (Table 3f). Conifer species such as white pine, pitch pine, Virginia pine, Table Mountain pine, etc, are present as dominant forest types; combined they make up about 18% of the the forested acres. Conifers are typically present, however, more as codominants or as a component within a stand.

The two most abundant forest types—White oak-Northern red oak-Hickory (FT 53: 20%) and Yellow poplar-White oak-Northern red oak (FT 56: 16%)—are found throughout the project area. FT 53 typically occurs as large clusters of stands whereas FT 56 tends to be individual stands fairly evenly distributed throughout the project area. Cove hardwood-White pine-

Hemlock (FT 41: 11%) is primarily associated with drainages, such as Little Paint Creek, Brushy Branch, and several tributaries to Paint Creek. Chestnut oak, either as a single species forest type (52) or more typically as a codiminant with other species, makes up a combined 22% of the project area's forested acres (Table 3f). The remaining forest types, largely made up of conifer species, contain less than 4% each, and are found scattered throughout the project area.

Table 3f: Forest Type Distribution – All NFS lands

Forest Type	Acres	%	Description
53	3186	20%	White oak- Red oak- Hickory
56	2542	16%	Yellow poplar- White oak- Red oak
60	1840	11%	Chestnut oak- Scarlet oak
41	1696	11%	Cove hardwood- White pine- Hemlock
42	1112	7%	Upland hardwoods- White pine
45	923	6%	Chestnut oak- Scarlet oak- Yellow pine
52	791	5%	Chestnut oak
15	655	4%	Pitch pine- Oak
59	503	3%	Scarlet oak
3	478	3%	White pine
16	423	3%	Virginia pine- Oak
10	286	2%	White pine- Upland hardwood
33	276	2%	Virginia pine
48	250	2%	Northern red oak- Hickory- Yellow pine
38	168	1%	Pitch pine
9	156	1%	White pine- Cove hardwood
4	122	1%	White pine- Hemlock
39	111	1%	Table Mountain pine
20	76	<1%	Table Mountain pine- Hardwoods
12	72	<1%	Shortleaf pine- Oak
32	50	<1%	Shortleaf pine
8	25	<1%	Hemlock- Hardwood
50	23	<1%	Yellow poplar
58	14	<1%	Sweetgum- Yellow poplar
5	13	<1%	Hemlock
Unc	345	2%	Unclassified Forest Type
Total	**16,136**		

Approximately 77% of the project areas' forested land is late-successional, greater than 80 years old, with 59% in the 81-110 age class and 18% in the 111 plus age class (Table 3g). The remaining 21% is split between immature (11-40: 12%), mid-successional (41-80: 8%) and early-successional (0-10: 1%) forest. Note that 2% of the project area is unclassified to age class.

Table 3g: Current age class distribution
in Paint Creek project area, all NFS lands

Age Class	Acres	%
Unc	278	2%
0-10	227	1%
11-40	1,986	12%
41-80	1,260	8%
81-110	9,546	59%
111+	2,839	18%
Total	**16,136**	

Hemlock Wooly Adelgid (HWA) is widespread through the Paint Creek project area. There are currently nine HWA treatment sites in the watershed, totalling approximately 12 acres.

Scope of Analysis

Unless otherwise stated, the scope of analysis for effects to Forest Resources are National Forest System lands, specifically in prescriptions 7.B, 7.E.2, and 8.C in compartments 205, 206, 209, 210, 213-219, 223, 262, and 264, hereafter defined as the project area. The time frame includes activities that have occurred within the past decade (i.e. 2004 – 2013) and future decade (2014 – 2023). This time frame was chosen because the affects of, and planning for, major vegetation management activities that would significantly affect age class distribution generally follows a 10-year planning cycle. There have been no major vegetation regeneration activities in the project area within the last ten years.

Effects Analyses of the Alternatives

Alternative A (No Action)

Direct and Indirect Effects

Successional Stages

The distribution of age class/successional stage of forested acres within the suitable 7.B, 7.E.2, and 8.C prescriptions (combined) in the Paint Creek project area are shown in Table 3k. Displayed are the current (2013) acres and current plus 10 years (2023) acres. The 'Plus 10-years' column reflects the distribution of age classes in the absence of vegetation management, as proposed under Alternative A, within the next decade. Overall, late-successional forest (80+ years old) and mid- to late-successional forest (41-80) would increase, while immature forest (11-40) would decrease due to succession (Table 3h). The existing early-successional forest (0-10) would disappear within the following decade.

Table 3h: Alternative A - Current and Plus 10-years
age class distribution of suitable acres in the project area

Age Class*	Current	%	Plus 10-years	%
0-10	101	1%	0	0%
11-40	1,713	24%	1084	15%
41-80	572	8%	1,192	17%
81-110	4,211	58%	3,341	46%
111+	607	9%	1,587	22%
Total	7,204		7,204	

** Early-successional forest is considered from 0-10 years old; immature forest 11 – 40 years old; mid- to late- successional forest 41 - 80 years old; and late-successional forest greater than 80 years old.*

Natural disturbances such as high wind events, snow/ice, insect/desease outbreaks, fire, etc would likely create patches of early successional forest during the 10-year period. However, given the stochastic nature of these events, they are unpredictable as to time, location and size (acres), and therefore cannot be calculated.

Prescription Objectives

Prescription 7.B (RLRMP, pp. 119-123) has no specific management objectives, i.e. no minimum or maximum percentages, for late-, mid- to late- and early-successional forest.

Objective 7.E.-1.01 (RLRMP, p. 133) is currently being met only for the late-successional age class (Table 3i). Late-successional forest would continue to dominate the landscape over the next decade (ibid). Mid- to late-successional forest would increase due to immature forest maturing and moving up to the next age class. However, the objective for mid- to late-successional forest would continue to not be met under this alternative. Early-successional forest would continue to be absent over the next decade, except where natural disturbance(s) created it (but see above).

Objective 8.C-1.01 (RLRMP, p. 142) is currently being met only for the late-successional age classes (Table 3i). The late-successional stage would increase slightly over the next decade. As in 7.E.2, mid- to late-successional forest would increase due to immature forest succeeding to the next age class; however, the objective for mid- to late-successional forest would continue to not be met. The early-successional forest objective for this age class (4%-8%) is currently not being met. The existing early-successional forest would disappear within the next decade, except where natural disturbance(s) created it (but see above).

Table 3i: Successional stage percentages per RLRMP Objectives
for suitable lands in 7.B,7.E.2, and 8.C

Successional Stage (age class)	7.B			7.E.2			8.C		
	2013	2023	RLRMP	2013	2023	RLRMP	2013	2023	RLRMP
Early (0-10)	2%	0%	NA	0%	0%	4 - 10%	1%	0%	4 - 8%
Immature (11-40)	18%	8%	NA	23%	8%	NA	24%	16%	NA
Mid- to Late- (41-80)	20%	30%	NA	5%	18%	≥ 50%	6%	14%	≥ 65%
Late (81 plus)	60%	62%	NA	72%	74%	≥ 20%	69%	70%	≥ 20%

Under Alternative A, the vast majority of the suitable forested acres would continue to be in the late-successional (81 plus) age class after 10 years (Tables 3h and 3i). Early-successional forest would be nonexistant. In time shade-tolerant species would come to dominate the project area reducing its overall biological diversity. The continued dominance of the late-successional age class would make the forest more suseptable to, and less resiliant to potentially large-scale invasive species infestations and disease outbreaks.

Old Growth

Old Growth must meet four criteria, as defined in "*Guidance for Conserving and Restoring Old Growth Forest Communities on National Forests in the Southern Region"* (Old Growth Guidance) (USDA Forest Service 1997). One criteria is a minimum age that, depending on Community Type, can vary from 100 to 140 years old. GIS data shows approximately 5,214 acres (32%) of all National Forest System lands within the Paint Creek Project area are currently at or are greater than 100 years old (Table 3j). Under Alternative A, this would nearly double, to approximately 9,507 acres (59%) with the next 10 years.

Table 3j: Acres ≥ 100 years-old
by prescription, all NFS lands

Prescription	2103	2023
4.A	757	1,614
7.B	890	1,540
7.D	26	37
7.E.2	1,228	1,676
8.C	2,068	4,174
9.F	9	60
12.A	236	406
Total	5,214	9,507

Alternative A would have no short-term impacts on Old Growth in the project area since the proposed actions would be deferred. This alternative would have a long-term impact on Old Growth by allowing stands, in the absence of major disturbance, to continue to mature and develop the characteristics considered necessary for Old Growth status.

Forest Health and Diversity

Deferring the vegetation management actions would not help improve general stand health by reducing competition for sunlight and nutrients, nor would it improve forest succession diversity. In addition, under this alternative, stands where the current forest/community type is considered uncharacteristic from that expected for the site would not be treated to help restore the stand(s) to their predicted/desired ecological conditions.

Cumulative Effects

When considered with past, present and reasonably foreseeable vegetation management actions, deferring the proposed management actions would have a cumulative effect on Forest Resources in the cumulative effects analysis area. Under this alternative, uncharacteristic forest types/ecological conditions, where they occur, would persist in the stands proposed for treatment. This would be cumulative with the lack of major vegetation management projects in the analysis area during the past 10 years. There are no ongoing or reasonably foreseeable vegetation management projects in the area.

All Action Alternatives

In addition to achieving the silvicultural objectives described in the alternatives below, the shelterwood, crop tree, midstory, thinning and group selection treatments would begin the long-term process of: 1) restoring sites dominated by an uncharacteristic[1] oak system, including sites with an overabundance of immature yellow poplar, to the expected shortleaf pine or mixed pine-oak system, 2) restoring pine-dominated sites, especially white pine-dominated sites, to the sites' expected oak, mixed oak-pine or cove-hardwood system, and/or 3) modifying the existing successional class (S-class) to increase the sites' structural diversity.

[1] Information on uncharacteristic vegetation and succession class can be found on the Cherokee National Forest Landscape Restoration Initiative website at: *www.communityplan.net/cherokee*.

The proposed prescribed burns would help restore/enhance fire-conditional ecosystems by stimulating the existing characteristic vegetation and by supporting restoration of sites where uncharacteristic vegetation exists within each burn block. Although not as site specific as the vegetation management treatments listed above, the burns would advance the development of yellow pine (shortleaf, pitch, Table Mountain) and mixed yellow pine-oak systems by creating conditions suitable for desired pine seedling establishment and expansion. The burns would also facilitate the development of oak, mixed oak-pine or cove-hardwood systems by reducing pine, primarily white pine, seedling and sapling abundance.

The short-term effects of the vegetation management methods on forest resources would be the same as those described in the alternatives below. However, one cycle of treatments would not achieve the desired ecological condition(s) in all sites, and therefore additional treatments would be required in the future. When considered together, the proposed Paint Creek Project and future projects/treatments would continue to promote and, over the long term, to restore "…the ecological processes necessary to make terrestrial and aquatic ecosystems sustainable, resilient, and healthy under current and future conditions" (CNF LRI 2012, p. 8).

Alternative B would affect the most acres of uncharacteristic vegetation, as identified and mapped by the LRI, within the Paint Creek Watershed (Table 3k). This is primarily due to the alternative's Upper Paint Creek prescribed burn, which is not proposed in Alternatives C and D. Of the three alternatives, Alternative D would affect the most acres through timber harvest alone.

Table 3k: Acres of uncharacteristic vegatation
affected within the Paint Creek Watershed by Alternative

Uncharacteristic Condition[1]	Acres	Timber Harvest[2]			Prescribed Burn[2,3]			Sum of All Actions[2,3,4]		
		B	C	D	B	C	D	B	C	D
Oak-dominated in pine systems	926	166	91	161	101	46	46	267	137	207
Pine-dominated in oak systems	215	0	0	14	30	13	13	30	13	27
White-pine dom. in cove and oak systems	105	15	105	64	53	39	39	68	142	103
Totals	**1246**	**181**	**196**	**239**	**184**	**98**	**98**	**365**	**292**	**337**
Percentages		15%	16%	19%	15%	8%	8%	29%	23%	27%

[1] *Does not include sites identified as 'Yellow poplar-dominated in oak system' (11.8 acres) or 'Not spruce-dominated in spruce system' (0.1 acres) since they would not be treated/affected by the proposed actions.*

[2] *Acres shown in the table were based only on where the proposed timber harvest (all methods combined) and/or prescribed burning treatments would overlap sites identified as having uncharacteristic conditions. Stands to be treated where such conditions do not occur were not included in the acreage calculations.*

[3] *Alternatives C and D do not include the Upper Paint Creek Prescribed Burn.*

[4] *Summed acres may exceed the total acres of the uncharacteristic condition due to sites receiving both timber harvest and prescribed burning treatments.*

Alternative B (Proposed Action)

Direct and Indirect Effects

Timber Harvest

Alternative B proposes to regenerate, via the shelterwood method, approximately 377 acres (17 stands) utilizing commercial timber harvest. Using this method, about 15-20 basal area (square feet per acre) would be retained in the treated stands. The basal area would be higher in some stands due to mitigation for scenery (see the Design Criteria and Scenery Effects Sections in this EA). This method would create a two-aged stand with an open overstory of mature hardwoods. Den trees would be selected first as leave trees, followed by oaks, hickories and other hardwoods in that order. The leave trees would remain through the next rotation. Regeneration would be from natural seeds and sprouting. Blight resistant American chestnut and/or red oak would be planted in regenerated areas post-harvest, if seedlings become available.

Some residual trees would be damaged during felling and skidding operations. Most of the damaged trees would recover quickly; however, open wounds would provide an entry point for insects and disease, and some of the damaged trees may die as a result. Any dead or dying standing trees would create snags, providing wildlife habitat.

Pre-haul road maintanence would have no impacts on forest resources since the activities (gravel placement and road grading) would occur on existing roads. Temporary road construction would

have minor short- term impacts (loss of trees, exposed soil, etc), but no long-term impacts on the resource since all temporary roads would be closed post-harvest, rehabilitated and the forest allowed to reclaim the roads' footprints over time.

Pre- and post-harvest release treatments (chainsaw slashdown and/or herbicides) are planned to ensure that the stands would have a strong component of mast-producing species to provide forage for wildlife. Without the treatments, less-desirable species such as yellow poplar and red maple, species considered to provide poor forage for wildlife, would increase at the expense of cherry, oaks, and hickories. The relative abundance and diversity of tree species may vary within the stands after treatment but changes in forest types would not be expected.

The proposed thinning (152 acres: eight stands) would result in a final basal area ranging from 35 to 60 ft^2/acre. Damaged and diseased trees would be removed first followed by scarlet oak, black oak, red maple, and white pine. All stands proposed to be thinned would receive the same pre-harvest treatment as that described for the shelterwood stands. Post-harvest treatments would be the same as those for shelterwooded stands, but on a selective basis, i.e., not all thinned stands would receive post-harvest treatment. Thinning would enhance species sustainability and promote stand vigor by reducing competition for light, nutrients, and moisture, thus improving the general health of the forest in the treated stands over the long term. Note that gaps up to two-acres would be created in commercially-thinned stands to provide small inclusions of ESF.

Release treatments - 674 acres (32 stands) of crop tree and 95 acres (two stands) of midstory - are proposed to reduce existing competition, in order to promote mast-producing trees such as oaks and hickories. If the stands are treated within 10 years, the advanced oak regeneration would be available to become a component of the future stands. If the stands are not harvested within this timeframe, the advanced oak regeneration would still be available to replace trees lost to natural causes.

Invasive species introduced by harvesting activities would be treated at every entry.

The shelterwood method, as well as crop tree, midstory and thinning treatments, would begin the process of restoring stands (sites) having an uncharacteristic forest/community type to the ecosystem(s) expected for the sites. The goal would be to move the uncharacteristic oak-dominated stands proposed for treatment to the expected pine (shortleaf) or mixed pine-oak system. Treating the uncharacteristic pine-dominated sites, including white pine-dominated sites, would help promote the oak, mixed oak-pine or cove-hardwood system expected for the stands. Since achieving the desired condition(s) through one cycle of treatments would not be feasible, additional treatments would be required in the future.

Prescribed Burning

The primary objective of the prescribed burns proposed under this alternative is to promote the health of forest communities. Prescribed burning would accomplish this by reducing midstory vegetation within the burn areas. The increased light levels reaching the understory would reduce competition for resources, promote natural regeneration, and stimulate new growth of grasses, herbs, and shrubs, forage for deer and turkeys, as well as soft mast for bears, birds and other species. The low intensity burns would not affect immature and mature mast-producing trees in

the burn area but could set back most of the oak regeneration. Taken as a whole prescribed burning would increase forest health and diversity throughout the burn areas.

In addition, years of fire exclusion has allowed shrubs, such as mountain laurel and rhododendron, to form extremely dense thickets of nearly impenetrable vegetation ('rhodo hells') that exclude most other vegetative species. Periodic burning reduces the density of the shrub component, allowing the mid and understory layers to receive more light, thus favoring the growth and diversity of other plant species, and hard-mast species such as oaks and hickory. Due to the prevalence of mountain laurel and rhododendron in the burn blocks, repeat burns may be required to achieve the objective.

Burning uncharacteristic oak-dominated sites would help promote pine (shortleaf) and mixed pine-oak systems by creating conditions suitable for pine seedling establishment and development. Burning uncharacteristic pine-dominated sites, including white pine-dominated sites, would have the opposite objective: reduce pine seedling and sapling abundance to help promote an oak, mixed oak-pine or cove-hardwood system. As with the proposed vegetation management treatments, additional prescribed burns would likely be needed in the future to achieve management objectives.

Successional Stages and Old Growth

Under Alternative B, early-successional forest would increase from the current 101 acres (1.4%) of the project area's suitable NFS lands to 478 acres, or 6.6% of the project area (Table 3l). The alternative would meet the early-successional forest objectives for 8.C but not for 7.E.2.

Table 3l: ESF (existing and proposed) by prescription

Prescription	Existing ESF	Acres Treated	Total ESF	Suitable Acres	Percent of Prescription	ESF Objective in RLRMP
7.B	22	30	52	1,102	4.7%	None
7.E.2	0	0	0	896	0.0%	4% - 10%
8.C	79	347	426	5,206	8.2%	4% - 8%
Totals	**101**	**377**	**478**	**7,204**	**6.6%**	

Thirty acres of ESF to be created is in the 7.B prescription, which has no specific early-successional forest objective (RLRMP, pp. 119-123). The remaining 347 acres of ESF to be created would be in the 8.C prescription, which has an ESF objective of 4%–8%. Combining the current ESF in the 8.C prescription (80 acres) with ESF proposed to be created in 8.C (347 acres) results in 427 acres of ESF, which equals 8.2% of the prescription's suitable acres (Table 3m). Approximately 67 acres of the current ESF in 8.C is nine years old and 13 acres is eight years old. The project is anticipated to be implemented in 2015. If this alternative is selected, the amount of ESF in 8.C in 2015 (current + proposed to be created) would be 360 total acres or 6.9% of the project area (Table 3m). Similarly, the amount of ESF in all suitable NFS lands (current + proposed) in 2015 would be 537 total acres or 7.5% of the project area.

Table 3m: 8.C acres of ESF – Current (2013),
Current + Proposed (Alt B) and Current + Proposed in 2015

Age Class	Current	%	Alt B	%	2014	%	2015	%
0-10	79	1.5%	426	8.2%	426	8.2%	359	6.9%
Total acres in 8.C Prescription								5,206

Alternative B would provide habitat for early-successional forest species within the project area. Edge habitat (the interface between treated and untreated forest) would increase the area's overall biological diversity. Shade tolerant and mature forest species, however, would experience a slight decrease in abundance over the short term. A reduction in upper canopy cover would allow more sunlight to reach the forest floor, and would reduce soil moisture holding capacity due to increased evaporation. The impacts would be minor given the current availability of mature forest that would remain in the area. In addition, in the absence of additional disturbance, the treated stands would provide habitat for shade tolerant/mature forest species as the stands regenerated and matured over time.

Alternative B would have no impacts on Old Growth in the project area since the stands proposed for early-successional habitat creation currently do not currently meet the Old Growth Guidance's minimum age requirement. However, the alternative would have a minor long-term impact on Old Growth since 348 acres would not mature to the minimum age(s) for Old Growth status. Note that, although 377 total acres of ESF are proposed to be created in this alternative, 29 acres would be inclusions (gaps up to two-acres in size) within stands proposed to be thinned. The impact is considered minor since the 348 acres is approximately 2.2% of the 16,136 acres of all NFS lands in the assessment area.

Forest Health and Diversity

Under Alternative B, late-successional forest (≥ 81 years-old) would be reduced from the current 67% to 61% of the analysis area (Table 3n), and would remain susceptible to oak decline, gypsy moth, Southern Pine Beetle, Hemlock Wooly Adelgid, and natural disasters such as wildfire, ice storms and wind events. Immature (11-40 years old) and mid- to late-successional forest (41-80 years old) would show no changes in acres under this alternative. Increasing the availability of early-successional forest (0-10 years old) would provide age class diversity needed for a more resilient forest.

Table 3n: Alternative B - Current and Proposed Action age class distribution (base year = 2013) of all suitable acres in the project area

Age Class	Current	%	Alt B	%
0-10	101	1.4%	478	6.6%
11-40	1,713	23.8%	1713	23.8%
41-80	572	7.9%	572	7.9%
81-110	4,211	58.5%	3,837	53.3%
111+	607	8.4%	604	8.4%
Total	7,204		7,204	

The combined 921 acres of proposed crop tree, midstory and thinning treatments would reduce competition for sunlight and nutrients, thereby improving the general health of the forest in the treated stands over the long term.

Restoration work proposed at Allen Gap Pond includes noncommercial thinning of two acres of white pine and hardwoods, treating woody vegetation with an aquatic-approved herbicide (Glyphosate) through direct application, and reducing the density of rhododendron. This would have negligible to no effects on forest health and diversity in the project area on the whole, but would maintain and improve wetland habitat conditions within the project area in general. The felled trees would remain on site, providing structural/habitat diversity in the area of the wetland.

Cumulative Effects

When considered with past, present and reasonably foreseeable future vegetation management actions, Alternative B would have a beneficial cumulative effect on forest health in the cumulative effects analysis area. The Paint Creek Project proposes approximately 1,300 acres of mechanical/herbicide treatments and 1,955 acres of low-intensity prescribed burning to promote forest health. This would be cumulative with past burns (5,283 acres) and planned future burns (1,818 acres) designed with the same objective. This would also be cumulative with 12 acres of Hemlock Wooly Adelgid treatments within the analysis area.

Alternative B would have a beneficial cumulative effect on the diversity of age classes in the analysis area. The approximately 377 acres of ESF proposed to be created in the project area would be cumulative with the ESF created through past prescribed burning. This alternative would ensure early-successional forest would persist in the analysis area over the long term.

Alternative B would have no cumulative impacts with regards to meeting the late-successional forest and old growth objective for 8.C. There have been no major timber harvest projects that would have affected the objective within the past 10 years, and there are none planned, other than the current project, in the future 10 years. Although 377 acres of late-succesional forest are proposed to be cut, the objective of maintaining "*…a minimum of 20 percent of forested acres in late-successional forest, including old growth"* would continue to be met under Alternative B.

Alternative C

Direct and Indirect Effects

Timber Harvest and Prescribed Burning

Direct and indirect effects of Alternative C's proposed vegetation management actions on Forest Resources would be similar to those described in Alternative B. Table 3o lists the proposed actions for the two alternatives.

Table 3o: Comparison of Alternative B and C proposed actions

Proposed Activity	Units	Alt B	Alt C
Shelterwood regeneration (commercial)	acres	377	302
Crop tree (noncommercial)	acres	674	49
Midstory (herbicide)	acres	95	84
Thinning (commercial)	acres	125	182
Proposed Activity	**Units**	**Alt B**	**Alt C**
Thinning (noncommercial)	acres	27	21
Prescribed burn	acres	1,955	1,955
Prehaul maintenance	miles	11.4	17.1
Construct permanent road	miles	0	1.0
Temporary road construction	miles	0.3	1.1

This alternative proposes to regenerate approximately 302 acres (20 stands) utilizing commercial timber harvest via the shelterwood method. Approximately 15 acres are in the 9.F prescription (Devil's Kitchen Branch Bog rare community). The 9.F acres are inclusions within three stands: Compartment 209, Stand 1 (nine acres), Stand 3 (three acres) and Stand 21 (three acres). The remaining portions of these stands, also proposed for regeneration treatment, are in the 7.E.2 prescription: Stand 1 (31 acres), Stand 3 (28 acres), and Stand 21 (15 acres).

Prior to the Devil's Kitchen Branch Bog being designated 9.F, the area's upland mesic hardwood forest was harvested in the late 1970s, and white pine was planted (as plantations) in most of the harvested stands, including the future rare community. The proposed shelterwood treatment would remove the plantation structure and reduce the white pine component in the designated 9.F to help restore a more characteristic (mesic hardwood) forest type within the upland portion of the DKBB rare community. This would meet prescription objective 9F-1.02, which calls for managing rare communities "…to maintain or restore characteristic structure, composition, and function of these communities…" (RLRMP, p. 145).

Alterantive C proposes more miles of pre-haul road maintanence and temporary road construction; however, the effects of the actions would be the same as that described under Alternative B. An approximately 0.3-mile section of FSR 93 is proposed to be decommissioned. This section bisects and is impacting the Cutshall Bog rare community. The proposed construction of 1.0 miles of FSR 93 would provide access to the stands proposed for treatment in Compartment 209, while helping to protect the Cutshall Bog rare community. Although

construction of the road would result in the loss of trees, the loss would have negligible impacts on the project area's forested landscape as a whole.

Under this alternative, there would be fewer acres of crop tree and midstory treatments, but more acres thinned than under Alternative B (Table 3o). The biggest change between the two alternatives would be in acres of proposed crop tree treatments – 49 acres (three stands) vs. 674 acres (32 stands), Alternative C and B, respectively. The effects of the proposed treatment would be the same as that described in Alternative B (i.e. reduce existing competition for light, nutrients and moisture, in order to promote mast-producing trees such as oaks and hickories), but over a smaller area. The effects from thinning would also be the same as those in Alternative B, but the increase in acres, primarily commercially-thinned acres, would affect a larger portion of the project area. The effects between the two alternatives from the proposed midstory treatments would be negligible.

The locations, acres, effects, etc, of prescribed burning proposed in Alternative C would be the same as that for Alternative B.

As with Alternative B, the proposed vegetation treatments, including prescribed burning, would begin the process of restoring stands (sites) identified as having an uncharacteristic forest/community type to the ecosystem(s) expected for the sites. The goals, under this alternative, would be to move the sites currently dominated by uncharacteristic oak species to either a pine or mixed pine-oak system, and to move sites currently dominated by white pine to a cove-hardwood or oak system. Again, additional treatments would be needed in the future to achieve the desired condition(s).

Successional Stages and Old Growth

Under Alternative C, early-successional forest would increase from the current 101 acres (1.4%) of the project area's suitable NFS lands to 403 acres, or 5.6% of the project area (Table 3p). The alternative would meet the early-successional forest objectives for 7.E.2 and 8.C. Prescriptions 7.B and 9.F have no specific ESF objectives, per the RLRMP.

Table 3p: ESF (existing and proposed) by prescription

Prescription	Existing ESF*	Acres Treated	Total ESF	Suitable Acres	Percent of Prescription	ESF Objective in RLRMP
7.B	21	27	48	1,102	4.4%	None
7.E.2	0	89	89	896	9.9%	4% - 10%
8.C	80	171	251	5,206	4.8%	4% - 8%
9.F	0	15	15	0	0.0%	None
Totals	**101**	**302**	**403**	**7,204**	**5.6%**	

Alternative C would provide habitat for early-successional forest species within the project area. Edge habitat (the interface between treated and untreated forest) would increase the area's overall biological diversity. Shade tolerant and mature forest species, however, would experience a slight decrease in abundance over the short term. A reduction in upper canopy cover would

allow more sunlight to reach the forest floor, and would reduce soil moisture holding capacity due to increased evaporation. The impacts would be minor given the current availability of mature forest that would remain in the area. In addition, in the absence of additional disturbance, the treated stands would provide habitat for shade tolerant/mature forest species as the stands regenerated and matured over time.

Alternative C would have no short-term impacts on Old Growth in the project area since none of the stands proposed for early successional habitat creation currently meet the Old Growth Guidance's minimum age requirement. However, this alternative would have a minor long-term impact on Old Growth since 302 acres would not mature to the minimum age for Old Growth status. The impact is considered minor since the 302 acres is 4% of the 7,204 acres of suitable NFS lands in the assessment area.

Forest Health and Diversity

Under Alternative B, late-successional forest (≥ 81 years-old) would be reduced from the current 67% to 64% of the analysis area (Table 3q), due to the proposed creation of 213 acres of ESF in late-successional forest. The remaining late-successional forest would be susceptible to oak decline, gypsy moth, Southern Pine Beetle, Hemlock Wooly Adelgid, and natural disasters such as wildfire, ice storms and wind events.

Table 3q. Alternative C – Current and Proposed Action age class distribution (base year = 2013) of all suitable acres in the project area

Age Class	Current	%	Alt C	%
0-10	101	1.4%	403	5.6%
11-40	1,713	23.8%	1,624	22.5%
41-80	572	7.9%	572	7.9%
81-110	4,211	58.5%	4,020	55.8%
111+	607	8.4%	585	8.1%
Total	7,204		7,204	

Approximately 89 acres of ESF would be created in immature forest (11-40 years old) (Table 3q). However, the ESF created would be in uncharacteristic white pine plantations in compartment 209, and includes 15 acres in the Devil's Kitchen Branch Bog rare community. This would improve forest health by restoring the plantations to mesic hardwood forest.

Mid- to late-successional forest (41-80 years old) would show no changes under this alternative (Table 3q). Increasing the availability of early-successional forest (0-10 years old) would provide age class diversity needed for a more resilient forest. The combined 336 acres of proposed crop tree, midstory and thinning treatments would reduce competition for sunlight and nutrients, thereby improving the general health of the forest in the treated stands over the long term.

Cumulative Effects

Cumulative effects of Alternative C would be similar to those discussed in Alternative B. Overall, Alternative C would have a beneficial cumulative effect on improving and maintaining age class diversity, succesional stages, and forest health in the cumualtive effects analysis area.

Alternative D

Direct and Indirect Effects

Timber Harvest and Prescribed Burning

Direct and indirect effects from timber harvest proposed under Alternative D would be the same as those described in Alternatives B and C. Alternative D would increase the amount of early-successional forest created and midstory treatments; would treat the same stands/acres for the crop tree and thinning treatments; and would add group selection with thinning (Table 3r).

Table 3r: Comparison of Alternatives B, C and D proposed actions

Proposed Activity	Units	Alt B	Alt C	Alt D
Shelterwood regeneration (commercial)	acres	377	302	398
Crop tree (noncommercial)	acres	674	49	674
Proposed Activity	**Units**	**Alt B**	**Alt C**	**Alt D**
Midstory (herbicide)	acres	95	84	513
Thinning (commercial)	acres	125	182	125
Thinning (noncommercial)	acres	27	21	27
Group Selection (commercial/noncommercial)	acres	0	0	103
Prescribed burn	acres	1,955	1,955	1,955
Prehaul maintenance	miles	11.4	17.1	16.2
Construct permanent road	miles	0	1.0	1.0
Temporary road construction	miles	0.3	1.1	0.3

Under this alternative, 21 acres (one stand) of ESF would be added to the 377 acres (17 stands) proposed to be created under Alternative B. Three of the 21 acres are in the 9.F prescription, the Devil's Kitchen Branch Bog rare community. As stated previously, the three acres would be treated to help restore the rare community (see Alternative C, Timber Harvest and Prescribed Burning above). The remaining 18 acres are in prescription 7.E.2.

Midstory treatments would reduce existing competition for light, nutrients, and moisture, and promote mast-producing trees such as oaks and hickories. The effects of the action would the same as that for Alternative B, only over a much larger area (see Table 3r). The effects of the proposed crop tree and thinning treatments would be the same as Alternative B.

Alternative D proposes to treat approximately 103 acres (five stands) through Group Selection with Thinning. Approximately 15 acres (three stands) are in the Devil's Kitchen Branch Bog rare community (prescription 9.F). As with the ESF proposed to be created in 9.F, the group selection

method would be used to help restore the rare community. (See Alternative C, Timber Harvest and Prescribed Burning above, for details on treating within the 9.F.)

Under the group selection method, approximately 20% of the stand would consist of one to two-acre groups scattered across and within the stand. Groups would not be created in designated 9.F. The remaining portion of the stand (and all of the designated 9.F) would be thinned to a final basal area ranging from 35 to 60 feet²/acre to improve species sustainability and promote stand vigor in the project area. Priority for removal would first be damaged and diseased trees followed by white pine, red maple, scarlet oak, and black oak. Favored reserve trees include trees with dens, large and long-living mast-producing trees and long-lived yellow pine. Likely species to leave include black gum, white oak, hickory, chestnut oak and yellow pine. Following harvest, each stand would be evaluated for the need for mechanical stand improvement treatments (chainsaw slashdown) and/or multiple low-intensity prescribed burns. The groups would also be evaluated post-harvest for possible planting of northern red oak, white oak and shortleaf pine.

The acres and the effects of prescribed burning proposed in Alternative D would be the same as that proposed in Alternative B.

Although more miles of pre-haul maintanence are proposed under this alternative, the action would have no impacts on forest resources since the activities (gravel placement and road grading) would occur on existing roads. Temporary road construction would have minor short-term impacts (loss of trees, exposed soil, etc) but no long-term impacts on the resource since all temporary roads would be closed post-harvest, rehabilitated and the forest allowed to reclaim the roads' footprints over time. The reroute of existing FSR 93 would have the same effects described in Alternative C. The new section of FSR 93 would provide access to the stands proposed for treatment in Compartment 209, including those in the DKBB rare community.

The relative abundance of individual tree species may vary from the previous stands' after treatment but forest type changes are not expected from the actions. Post-sale release treatments are planned to ensure that the stands would have a strong component of mast-producing species to provide forage for wildlife. Without the treatments, species such as yellow poplar and red maple, species considered to provide poor forage for wildlife, would increase in relative abundance at the expense of cherry, oaks, and hickories. The release treatments would reduce the competition for sunlight and nutrients, thereby improving the general health of the forest in the treated stands over the long term.

As with Alternatives B and C, the shelterwood, crop tree, midstory, thinning, group selection and prescribed burning treatments proposed under Alternative D would help restore stands (sites) identified having an uncharacteristic forest/community type to the ecosystem(s) expected for the sites. Of the three alternatives, this alternative would restore more uncharacteristic acres in the project area than the other two (181 acres, 197 acres and 240 acres, Alternatives B, C and D, respectively). The goal would continue to be to move the uncharacteristic oak-dominated stands proposed for treatment to the expected pine (shortleaf) or mixed pine-oak system; and to treat the uncharacteristic pine-dominated sites, including white pine-dominated sites, to promote the oak, mixed oak-pine or cove-hardwood system expected for the stands. Since achieving the desired

condition(s) through one cycle of treatments would not be feasible, additional treatments would be required in the future.

Successional Stages and Old Growth

Alternative D would have similar effects as those described in Alternative B. Overall, early successional habitat would increase from the current 1.4% of the project area to approximately 6.9% under Alternative C (Table 3s). This alterantive would not meet the minimum early successional objectives for 7.E.2 (ibid). It would exceed the objective for 8.C (ibid), but see Alternative B, *Successional Stages and Old Growth* above. Prescriptions 7.B and 9.F have no specific ESF objectives, per the RLRMP.

Table 3s: Alternative C ESH Acres Treated by Suitable Prescription – All NFS lands

Prescription	Existing ESF	Acres Treated	Total ESF	Suitable Acres	Percent of Prescription	ESF Objective in RLRMP
7.B	21	30	51	1,102	4.6%	None
7.E.2	0	18	18	896	2.0%	4% - 10%
8.C	80	347	427	5,206	8.2%	4% - 8%
9.F	0	3	3	0	0.0%	None
Totals	**101**	**398**	**499**	**7,204**	**6.9%**	

Alternative D would provide habitat for early successional forest species and increase the diversity of age classes in the Paint Creek Project area. The creation of edge habitat would increase the area's overall biological diversity. Shade tolerant and mature forest species would likely experience a slight decrease in abundance over the short term due to the loss of late successional habitat. However, the impact would be minor given the current availability of mature forest that would remain in the area.

Alternative D would have no short-term impacts on Old Growth in the project area since none of the stands proposed for early successional habitat creation currently meets the Old Growth Guidance's minimum age requirement. However, this alternative would have a minor long-term impact on Old Growth within the project area since 376 acres would not mature to the minimum age for Old Growth status. Note that, although 398 total acres of ESF are proposed to be created in this alternative, 22 acres would be inclusions (gaps up to two-acres in size) within six stands proposed to be thinned. The impact is considered minor since the 376 acres is approximately 2.3% of the 16,136 acres of all NFS lands in the assessment area.

Forest Health and Diversity

Alternative D would have the same effects on forest health and diversity as those described in Alternative B. Late-successional forest (≥ 81 years old) would be reduced from the current 67% to 62% of the analysis area due to the proposed 320 acres of ESF created in this successional stage (Table 3t). However, late-successional forest would continue to dominate the project area. The remaining late-successional forest would be susceptible to oak decline, gypsy moth, Southern Pine Beetle, Hemlock Wooly Adelgid, and natural disasters such as wildfire, ice storms and wind events.

Table 3t. Alternative D – Current and Proposed Action age class distribution (base year = 2013) of suitable acres in the project area

Age Class	Current	%	Alt D	%
0-10	101	1.4%	499	6.9%
11-40	1,713	23.8%	1,692	23.5%
41-80	572	7.9%	572	7.9%
81-110	4,211	58.5%	3,891	54.0%
111+	607	8.4%	550	7.6%
Total	**7,204**		**7,204**	

Immature forest (11-40) would also be reduced due to 21 acres of ESF creation, but the decrease would only be 0.3%, a minor impact. There would be no changes in suitable forested acres in mid- to late-successional forest (41-80). Early-successional forest would increase under this alternative (1.4% to 6.9%), providing age class diversity needed for a more resilient forest over the long term.

The combined 1442 acres of proposed crop tree, midstory, thinning and group selection treatments would reduce competition for sunlight and nutrients, thereby improving the general health of the forest in the project area over the long term.

Restoration work proposed at Allen Gap Pond includes noncommercial thinning of two acres of white pine and hardwoods, treating woody vegetation with an aquatic-approved herbicide (Glyphosate) through direct application, and reducing the density of rhododendron. This would have negligible to no effects on forest health and diversity in the project area on the whole, but would maintain and improve wetland habitat conditions within the project area in general. The felled trees would remain on site, providing structural/habitat diversity in the area of the wetland. Restoration work proposed at Cutshall Bog, a designated rare community (9.F), includes removing a 0.3-mile section of FSR 93 bisecting the bog, after it's been decommissioned. Removing the crossing and associated limestone rip-rap would restore a natural flow regime and pH to Cutshall bog. Encroaching woody vegetation would be treated mechanically (chainsaws) and/or with an aquatic-approved herbicide (Glyphosate) through direct application. Some trees may be felled, but this would be done noncommercially with the trees left on site to provide structure. As with the work at Allen Gap Pond, this would have negligible to no effects on forest health and diversity in the project area on the whole, but would improve wetland habitat conditions within the project area in general.

Finally, restoration work proposed in the Devil's Kitchen Bog rare community and Rough Branch Beaver Pond would be to control encroaching woody vegetation mechanically (chainsaws) and/or with an aquatic-approved herbicide (Glyphosate) through direct application. Some trees may be felled, but this would be done noncommercially with the trees left on site to provide structure. As with the work at Allen Gap Pond and Cutshall Bog, this would have negligible to no effects on forest health and diversity in the project area on the whole, but would improve wetland habitat conditions within the project area in general.

Cumulative Effects

Alternative D would have the same cumulative effects as those discussed in Alternative B. Overall, Alternative D would have a beneficial cumulative effect on improving and maintaining age class diversity, succesional stages, and forest health in the cumualtive effects analysis area.

Health and Safety

Affected Environment

This section specifically discusses the effect of herbicide use on the health and safety of forest users and workers. Effects of herbicide use on other resources, such as soil, water, wildlife, etc, are discussed under their respective heading. Forest users and Forest workers occasionally visit the project areas. Hunters are most likely to visit these areas. Forest Service employees visit these areas while performing administrative and maintenance duties.

Scope of Analysis

The scope of analysis is the individual boundaries of the vegetation treatment areas proposed for herbicide use, as listed in Alternatives B, C and D (see pp 20-42 of this EA). The time frame is generally from when the first project area is treated to less than one year beyond the time when the last project area in this analysis is treated, about 10 years from present.

Effects Analysis of the Alternatives

Alternative A (No Action)

Direct, Indirect and Cumulative Effects

Under the No Action alternative, herbicides would not be used within the treatment areas proposed in the Paint Creek project. There would be no increased health hazards or risks to forest users (general public) and Forest Service personnel beyond those already associated with recreating and working in a forested environment. There would be no cumulative effects to human health with this alternative.

Alternative B (Proposed Action)

Direct and Indirect Effects

Unless otherwise noted, information presented is from Risk Assessments prepared for the Forest Service by Syracuse Environmental Research Associates, Inc. (SERA). SERA Risk Assessments for individual herbicides may be found at: http://www.fs.fed.us/foresthealth/pesticide/risk.shtml.

All three herbicides are proposed for site preparation and release treatments, two are proposed for midstory (Glyphosphate and Imazapyr) and one (an aquatic-approved version of Glyphosphate) for wetland restoration. The chemicals are effective for situations encountered with this project, with minimal environmental impacts. The chemicals were chosen because one is more effective on particular vegetation or in a particular situation than another. Which chemical to use would depend on the plant species to be controlled, the plant species to be

released and maintained, and the overall objectives. Herbicides and Forest Service use rates are shown in Table 3u. See Appendix C-Herbicide Use Assumptions for herbicides to be used.

Table 3u: Herbicides and Use Rates

Herbicide	Use Rate Per Acre	Remarks
Glyphosate	2.0 lbs a.e.*	Formulations without surfactants
Triclopyr	1.0 lbs a.e.	
Imazapyr	0.15 lbs a.e.	

* a.e. = acid equivalents

Herbicides would be used within an area of up to 626 acres in this alternative, but not all of the area would be treated due to the selective nature of the applications. Approximately 138.6 lbs a.e. of Glyphosate, 6.2 lbs a.e. of Imazapyr, and 1.6 lbs a.e. of Triclopyr, for a total of 146.4 lbs a.e. of chemical would be used. This use is, on average, about 0.23 lbs a.e./acre.

Mitigation measures (design criteria) are designed to minimize human health risks. Following all handling, application and safety instructions would further reduce risks. Forest users may encounter herbicide treated areas as they visit the forest. Signage during treatment would discourage use of the treated area(s). Forest workers applying the herbicides are exposed for longer periods and to more volume of herbicide than a casual forest visitor. At typical Forest Service use levels, however, the SERA Risk Assessments for all three chemicals states that there is little potential risk to the health of workers and the general public. Table 3v provides a comparison of common health risks for the three chemicals:

Table 3v: Comparison of Common Health Risks for Glyphosate, Imazapyr and Triclopyr

Herbicide	Toxicity[1]	Carcinogenic	Irritating to skin and eyes	Birth defects	Persistence
Glyphosate	low	no evidence	non to slightly irritating	not observed	not persistent
Imazapyr	low	no evidence	irritating	not observed	not persistent
Triclopyr	low	marginally	slightly irritating	at toxic levels [2]	not persistent

[1] Toxicity to mammals (SERA); for comparison, caffeine has a moderate toxicity (USDA, Forest Service 1989)

[2] No birth defects were observed below levels that Triclopyr is toxic; extremely high levels of chemical, above that which would kill the test subject, are required to cause birth defects

JLB Oil

JLB Oil, a mineral oil, is used as an adjuvant to mix with the formulation of Triclopyr sold under brand names such as Garlon 4. Mineral oils are classified as very slightly toxic, are slight skin irritants, but not eye irritants. There is no evidence for carcinogenicity (USDA, Forest Service 1989).

Cumulative Effects

There are no planned uses of herbicides in the cumulative effects analysis area, other than those proposed in the Paint Creek Project, within the next 10 years. With the mitigation measures and application precautions in place, the herbicides are not expected to leave the treatment areas, nor are they expected to enter them from other treatment areas. Due to the spatial arrangement of the

proposed treatment areas and the time frames when they may be treated, it is highly unlikely that any one forest user would visit multiple-treated areas during the time when exposure to the chemicals might occur. Forest workers would not work in multiple areas within a time frame that would result in cumulative effects. The rapid elimination and lack of persistence of these chemicals in the body would preclude accumulation to the point of having a cumulative effect. Also, the SERA Risk Assessment states that repeated exposures below a toxic threshold should not be associated with cumulative toxic effects. Based on this analysis, cumulative effects from herbicide use are not expected with this alternative.

Alternative C

Direct and Indirect Effects

Although Alternative C would result in a slight decrease in the amount of herbicide use compared to Alternative B (626 acres vs. 615 acres, respectively), the overall impacts to health and safety from activities proposed under Alternative C would be the same as those for Alternative B above. The potential for a forest user to visit a treated area, however, would be greater under this alternative due to the increase in the number of treatment areas proposed (39 stands vs. 24 stands, Alternative C and B respectively).

The SERA Risk Assessments for all three chemicals states that at the typical Forest Service use levels there is little potential risk to the health of workers and the general public.

Cumulative Effects

Cumulative effects from Alternative C would be the same as those described for Alternative B above, i.e. there would be no cumulative effects on the health of Forest Service workers and the general public from herbicide use expected with Alternative C.

Alternative D

Direct and Indirect Effects

Alternative D would result in an increase in the amount of herbicide use compared to Alternatives B and C (1,099 acres, 626 acres, and 615 acres, respectively). The overall impacts to health and safety from activities proposed under Alternative D would be the same as those for Alternative B above. The potential for a forest user to visit a treated area, however, would be greater due to the increase in the number of treatment areas proposed under Alternative D (41 stands, 39 stands, and 24 stands, Alternatives D, C, and B, respectively). In addition, Forest workers applying the herbicides would be exposed to more volume of herbicide under Alternative D than the other two alternatives. However, the SERA Risk Assessments for all three chemicals states that there is little potential risk to the health of workers and the general public.

Cumulative Effects

Cumulative effects from Alternative D would be the same as those described for Alternative B above, i.e. there would be no cumulative effects on the health of Forest Service workers and the general public from herbicide use expected with Alternative D.

Biological Resources

Terrestrial Resources

Affected Environment

Analysis of effects to biological resources loosely follows the framework used in the RLRMP to ensure comprehensive consideration of project effects. The management indicator species (MIS), demand, rare, and non-native invasive species (NNIS) are analyzed using best available science, including species habitat requirements, current project area data, and field surveys. Species that occur in the areas proposed for treatment and/or have the potential to be impacted by the alternatives will be discussed. Other species identified in the RLRMP that do not occur and/or would not be impacted are not discussed further in this document.

For species distribution and life history information see 'MIS, Demand, and Rare Species of the Northern CNF' (Thomas 2012). Terrestrial habitats in the PCAA are listed in Table 3w.

Table 3w: Terrestrial Habitats of the Paint Creek Watershed

Major Forest Communities	**Acres**	**Percent of Area**
Mesic Deciduous (MDF)	7,464	47%
Eastern Hemlock/White Pine (EHWP)	1081	7%
Oak & Oak-Pine (OOPF)	8,560	53%
Pine & Pine/Hardwood (PPHW)	1,835	11%
Successional Habitats	**Acres**	**Percent of Area**
Early-successional Forest (ESF)	239	2%
Sapling/pole Forest (SPF)	1,826	11%
Mid-successional Forest (MSF)	1,271	8%
Late-successional Forest & Old Growth (LSOG)	12,592	79%
Other Terrestrial Habitats	**Acres**	**Percent of Area**
Riparian Forests	2,769	17%
Permanent Openings (PO)	164	1%
High Elevation Shrubby Habitats (HESF)	22	0%
Snags, Dens, Downed Wood (SDDW)	13,863	86%

Scope of Analysis

The analysis area (AA) for available habitat, direct, indirect, and cumulative effects on terrestrial resources is the Paint Creek watershed. Affected areas include Compartments 205, 206, 207, 209, 210, 213-219, 223, 262, and 264. The analysis includes both suitable and unsuitable acres. The timeframe for cumulative effects analysis is the past ten years through the next 20 years.

This time frame addresses past actions that currently provide early successional habitat and future conditions at the project level 20 years into the future that would resemble conditions present today. Table 3x lists activities in the analysis area considered for cumulative effects.

Table 3x: Activities Considered in Cumulative Effects Analysis

Activity	Acres in AA	Past 10 years	Future 20 Years
Rough Branch Thinning	40	Yes	No
Bellcow Mountain Burn	1,818	Yes	Yes
Cummins Branch Burn	778	Yes	No
Spring Mountain Burn	1,541	Yes	No
Lone Pine Gap Burn	1,103	Yes	No
Henry Ridge Burn	28	Yes	No
Phillips Hollow Burn	15	Yes	No
Cummins Branch Borrow Pit	3	Yes	Yes
Hemlock Treatments	12	Yes	Yes

Management Indicator Species

Table 3y lists MIS considered in detail in the AA. Current trend data for the CNF is not available; trends (2000-2011) were obtained from USGS Patuxent Wildlife Research Center (Sauer et al. 2012). Note: black bear, an MIS and demand species, is discussed in the demand species section.

Table 3y: MIS of the Paint Creek Analysis Area

Management Indicator Species	Representative Habitat	Current Acres of Available Habitat	TN Population Trend
Prairie warbler	Early-successional Forest (ESF)	254	Decrease (-2.5)
Chestnut-sided warbler	High-elevation ESF (HESF)	6	Decrease (-4.2)
Acadian flycatcher	Mature Riparian Forest (MRF)	2,769	Increase (1.6)
Hooded warbler	Mid-late Mesic Deciduous (MDF)	6,287	Increase (2.4)
Pine warbler	Mature Pine forests (PPHW)	1,676	Increase (0.2)
Scarlet tanager	Mid-late Successional (OOPF)	7,914	Increase (2.3)
Ovenbird	Mature Deciduous Forest Interiors	11,432	Decrease (-3.0)
Pileated woodpecker	Abundance of snags (Mature Forest)	13,863	Increase (1.3)

Effects Analyses of the Alternatives

Alternative A (No Action)

Direct and Indirect Effects

Under Alternative A, habitat for and populations of *Acadian flycatcher, hooded warbler, pine warbler, ovenbird, pileated woodpecker,* and *scarlet tanager* would continue on their current trends (Table 3y). *Prairie warbler* and *chestnut-sided warbler* breeding habitat and populations would decrease considerably in the analysis area due to absence of ESF and loss of SPF in the next 20 years.

Cumulative Effects

The No Action alternative would have no cumulative effects on *Acadian flycatcher, chestnut-sided warbler, pine warbler, prairie warbler, hooded warbler, ovenbird, pileated woodpecker,* or *scarlet tanager* because any action would be deferred and would not be cumulative with other activities in the analysis area. Populations would continue on their current trends (see Table 3y).

Alternatives B, C, and D

The types of effects on MIS would be the same for Alternatives B, C, and D. Only the size and magnitude of the effects would differ, so the alternatives will be addressed together.

Impacts Common to All Species

Pre and post-harvest, midstory treatments, and wetland improvements would require herbicides, but only a portion of the acres treated would be directly impacted. The herbicides used are unlikely to contact MIS and demand species directly, but may be present on food sources that are ingested (plants and insects). They are of low toxicity to mammals and birds (Tu et al 2001). The following factors would minimize the risk of contamination: 1) herbicide applied in small amounts; 2) specific methods of application such as thinline or stump treatments; 3) design criteria for herbicide use, e.g. timing to avoid rainfall; 4) stream buffers would protect riparian habitats; 5) birds are highly mobile and are able to leave the areas during treatment.

Direct and Indirect Effects

Prairie warbler may be directly impacted by crop tree release and post-harvest treatments. If implemented during the breeding season, these activities may disrupt nesting behavior, potentially causing mortality of young in the nest. Mortality would be likely if trees with nests are cut. Prescribed burning would occur during months when warblers have migrated to their winter habitat.

Currently, habitat for this species is scarce in the analysis area. Foraging and nesting habitat would become available by the creation of low elevation ESF. Without naturally occurring fires, active management is necessary to create the ESF required and to maintain a mosaic of different successional stages (NatureServe 2012). Thinning and group selection may also provide small pockets of ESF for prairie warbler. Harvest and post-harvest treatments in these areas would ensure the continued existence of habitat and population increases. Prescribed burning in the all burn units may provide some ESF if small pockets burn more intensely and kill some of the overstory. Crop tree release in existing habitat may improve open conditions, making habitat more suitable for nesting and foraging, and may extend the period of occupation in those stands.

Midstory treatments, wetland improvements, tree planting, nest/bat box installation, waterhole construction, drumming logs, and road activities (maintenance, reconstruction, construction, decommission, authorization) would not occur in suitable habitat or create habitat, and would have no effect on prairie warblers.

These alternatives (Table 3z) would provide habitat that is currently missing in the Paint Creek watershed. They would contribute to a local population increase and contribute to stability and continuation of populations on the CNF.

Table 3z: Acres of Prairie Warbler Habitat Impacted by Activity and Alternative

Activity	Alternative		
	B	C	D
ESF	337	287	398
Thinning	152	203	152
Group selection	0	0	103
Crop tree release	674	49	674
Pre & post-harvest treatments	489	490	550

Chestnut-sided warbler may be directly impacted by post-harvest treatments. If implemented during breeding season, these activities may disrupt nesting behavior, potentially causing mortality of young in the nest. Mortality would be likely if trees with nests are cut. Impacts would be very small scale and short term. Prescribed burning would occur during months when warblers have migrated to their winter habitat.

Currently, habitat for this species is scarce to non-existent in the analysis area. Foraging and nesting habitat would become available by the creation of ESF in one high elevation stand (Alternatives B and D). This species reaches its highest densities in ESF which provide increased vegetation complexity (Richardson et al 1995). Harvest and post-harvest treatments would ensure population increases and continued existence of habitat in the analysis area. With the absence of natural disturbances, timber harvest or similar activities effectively provides habitat for these warblers (NatureServe 2012). Prescribed burning in the Upper Paint Creek Unit may provide some HESF if small pockets burn more intensely and kill some of the overstory. Burning in other units would not occur at high elevations.

Thinning, group selection, midstory treatments, crop tree release, wetland improvements, tree planting, nest/bat box installation, waterhole construction, drumming logs, and road activities (maintenance, reconstruction, construction, decommission, and authorization) would not occur in suitable habitat or create habitat, and would have no effect on chestnut-sided warblers.

These alternatives (Table 3aa) would provide habitat that is currently missing in the Paint Creek watershed. They would contribute to a local population increase and contribute to stability and continuation of populations on the CNF.

Table 3aa: Acres of Chestnut-sided Warbler Habitat Impacted by Activity and Alternative

Activity	Alternative		
	B	C	D
ESF	20	0	20
Post-harvest treatments	20	0	20

Acadian flycatcher may be negatively impacted from activities (harvest, road work, midstory treatments, wetland improvements, and road decommissioning) occurring within suitable habitat. Disruption of breeding and foraging behavior could occur during breeding season. These impacts would be extremely minor and short term. Because nests are typically built along the stream edge

which is protected by riparian zone standards (RLRMP - no cutting along streams), nests would not be directly impacted. Prescribed burning would occur during months when Acadian flycatchers have migrated to their winter habitat.

Habitat would mostly be protected by riparian zones; however, some habitat on the outside edges of those zones may be used by these birds. Harvesting (ESF, thinning, and group selection) in these areas may reduce suitable habitat. Felling of trees for wetland improvements and midstory treatments may alter habitat, but these impacts would be extremely small scale and habitat would remain. Burning is not likely to have a measurable effect on Acadian flycatcher habitat. As fire backs down from the ridges, it usually goes out before it reaches the riparian areas. If it does continue to burn, it is of a very low intensity, usually burning only the leaf litter.

Crop tree release, post-harvest treatments, tree planting, nest/bat box installation, waterhole construction, drumming logs, and road activities (maintenance, reconstruction, construction, and authorization) would not occur in suitable habitat or create habitat, and would have no effect on Acadian flycatchers.

Although Acadian flycatcher habitat would be altered in the Paint Creek watershed, the small amount of habitat impacted and the large amount of habitat available across the analysis area would remain sufficient to support breeding requirements. Impacts from the alternatives (Table 3bb) would not negatively influence the population trends in the analysis area.

Table 3bb: Acres of Acadian Flycatcher Habitat Impacted by Activity and Alternative

Activity	Alternative		
	B	C	D
ESF	33	33	33
Thinning	10	15	10
Group selection	0	0	3
Midstory	5	5	10
Pre-harvest treatments	43	48	43
Wetland Improvements	2	25	36
Road decommission	1	2	2

Hooded warbler would be directly impacted by the alternatives. Harvest (ESF, thinning, and group selection), midstory treatments, and temporary road construction implemented during breeding season would disrupt nesting behavior, potentially causing mortality of nestlings. Hooded warblers are likely to abandon a nest site if disturbed during building, but once the eggs are laid, they are not likely to abandon the nest. Mortality would be likely if shrubs with nests are cut or are crushed by fallen trees or heavy equipment. Impacts would be considered minor and short term in context of the surrounding landscape where suitable habitat is abundant. Prescribed burning would occur during months when warblers have migrated to their winter habitat.

The creation of ESF would create canopy gaps, increasing the shrub component that is essential for nesting. Hooded warblers commonly occupy ESF and remain as long as the shrub layer is suitable (Ogden and Stuchbury 1994). They have been found using deciduous clear-cuts in Tennessee, with population density increasing from two to nine years after harvest (Nicholson

1997). Although these birds inhabit ESF, they are more abundant in mature forests with dense understory (NatureServe 2012). Breeding birds may move to adjacent areas with suitable habitat or they may nest within the harvested areas. Mature MDF in adjacent areas and streamside management zones within harvested areas (with dense shrub components) would continue to provide ideal nesting habitat for the species.

Pre- and post-harvest treatments, midstory treatments, and prescribed burning would temporarily reduce nesting habitat suitability for hooded warbler by reducing shrub layer density in the first year or two after treatment. Hooded warbler population declines have been documented due to repeated burning and recovery has taken longer than one year (Artman et al. 2001). However, these improvements may stimulate understory growth, promoting the return of a thicker shrub layer over time. ESF creation, midstory treatment, crop tree release, and wetland improvements would increase sunlight and insect production in treated areas, improving foraging habitat.

Tree planting, nest/bat box installation, waterhole construction, drumming logs, and other road activities (maintenance, reconstruction, decommission, and authorization) would not occur in suitable habitat or create habitat, and would have no effect on hooded warblers.

Although hooded warbler habitat would be altered in the Paint Creek watershed, the amount of habitat available across the analysis area would remain sufficient to support the species' breeding requirements. Hooded warblers would still be able to use the habitat altered by implementation. Impacts from the alternatives (Table 3cc) would not negatively influence the population trends in the analysis area.

Table 3cc: Acres of Hooded Warbler Habitat Impacted by Activity and Alternative

Activity	Alternative		
	B	C	D
ESF	215	190	215
Thinning	69	101	69
Midstory	95	62	326
Crop tree release	527	49	527
Pre & post-harvest treatments	284	291	284
Wetland Improvements	2	25	36
Road construction	0	1	1

Pine warblers return to their breeding habitat as early as March (Nicholson 1997), so they are more likely to be directly impacted by project activities. Harvest (ESF, thinning and group selection), road construction, and prescribed burning implemented during breeding season would disrupt nesting behavior, potentially causing mortality of young in the nest. Mortality would be likely if trees with nests are cut or crushed by fallen trees or heavy equipment or burned. Impacts would be considered minor and short term in context of the surrounding landscape where suitable habitat is abundant.

A small amount of breeding habitat (mature PPHW and EHWP) suitability may be reduced by ESF, thinning, group selection, and possibly prescribed burning. They often prefer pine forests with large, often dense canopies, but also are known to nest in areas with lower canopy cover. Since some trees would remain in harvested areas, pine warblers may nest along the borders as they are sometimes attracted to forest edges (NatureServe 2012, Nicholson 1997). Pre-harvest treatments and prescribed burning may improve habitat conditions by creating a more preferred open midstory. These activities would allow more sunlight into treated areas, increase insect production, and improve foraging habitat for the species.

Other proposed activities including midstory treatments, crop tree release, wetland improvements, tree planting, nest/bat box installation, waterhole construction, drumming logs, and other road activities (maintenance, reconstruction, decommission, and authorization) would not occur in suitable habitat or create habitat, and would have no effect on pine warblers.

Although pine warbler habitat would be altered in the Paint Creek watershed, the amount of habitat impacted is very small scale and the habitat available across the analysis area would remain sufficient to support breeding requirements. Impacts from the alternatives (Table 3dd) would not negatively influence the population trends in the analysis area.

Table 3dd: Acres of Pine Warbler Habitat Impacted by Activity and Alternative

Activity	Alternative		
	B	C	D
ESF	28	23	28
Thinning	30	37	30
Group selection	0	0	32
Pre-harvest treatments	58	60	58
Road construction	0	1	1

Scarlet tanager would be directly impacted by the alternatives. Harvest (ESF and thinning), midstory treatments, wetland improvements, and road construction during breeding season would disrupt nesting behavior. Studies indicate that scarlet tanagers abandon nest sites if logging occurs in occupied breeding habitat during nesting (Mowbray 1999). Felling of trees with nests would cause mortality of young. Impacts would be considered minor and short term in context of the surrounding landscape where suitable habitat is abundant. Prescribed burning would occur during months when tanagers have migrated to their winter habitat.

Breeding habitat (mature OOPF) suitability would be reduced by ESF creation and thinning. Since some trees would remain in harvested areas, tanagers may continue to nest there. Where they do not overlap with summer tanagers (as in the analysis area), scarlet tanagers occupy more open habitat and are not restricted to dense canopy cover (Nicholson 1997). Scarlet tanagers may reoccupy harvested areas as early as 12 years after cutting, if some small trees are left standing. They are known to tolerate small or narrow clear-cuts, thinning, and selection cutting (NatureServe 2012). Scarlet tanagers in the Paint Creek watershed have been documented utilizing harvested areas during breeding bird surveys.

Midstory treatments, wetland improvements, and burning in OOPF would not reduce habitat suitability. These activities along with ESF creation would allow more sunlight into treated areas, increase insect production, and improve foraging habitat for the species.

Other proposed activities including group selection, crop tree release, tree planting, nest/bat box installation, waterhole construction, drumming logs, and other road activities (maintenance, reconstruction, decommission, and authorization) would not occur in suitable habitat or create habitat, and would have no effect on scarlet tanagers.

Although scarlet tanager habitat would be altered in the Paint Creek watershed, the amount of habitat available across the analysis area would remain sufficient to support the species' breeding requirements. Impacts from the alternatives (Table 3ee) would not negatively influence the population trends in the analysis area.

Table 3ee: Acres of Scarlet Tanager Habitat Impacted by Activity and Alternative

Activity	Alternative		
	B	C	D
ESF	216	124	216
Thinning	65	102	65
Midstory	0	0	367
Pre-harvest treatments	281	226	284
Wetland Improvements	2	25	36
Road construction	1	1	1

Ovenbird would be directly impacted by the alternatives. Harvest (ESF and thinning), midstory treatments, and road construction during breeding season would disrupt nesting behavior and potentially cause mortality of nesting young. Soil movement, falling trees, or heavy equipment could crush nests and offspring on the ground. Impacts would be considered minor and short term in context of the surrounding landscape where suitable habitat is abundant. Prescribed burning would occur during months when ovenbirds have migrated to their winter habitat.

Suitable breeding habitat would decrease in ESF areas. Ovenbirds prefer a closed canopy and are absent or at low densities in areas with open overstory (NatureServe 2012). Removal of most of the overstory to create ESF would negatively impact habitat suitability in harvested stands. Ovenbirds are generally absent from heavily cut stands (Van Horn and Donovan, 1994). Local population densities would decline in harvested areas and remain low until canopy closure returned, which could take up to 20 years. Nesting habitat may still be suitable in thinned areas. Midstory treatments would not impact nesting habitat because the overstory canopy would remain intact.

Ovenbirds nest in areas with thick leaf litter and use leaves and small twigs to build nests on the ground. Fire would eliminate much of the nesting habitat in the burn areas, and ovenbirds may not return for more than a year (Artman, et al 2001). Fire burns in a mosaic pattern, leaving patches of unburned leaf litter, so nesting habitat would remain scattered across the burn units.

Ovenbirds would not be eliminated from burned areas, but densities would be reduced. Populations would return to previous levels within a few years after burning.

The reduction of leaf litter from burning would improve ground foraging conditions for this species, which has been observed foraging in burned areas (Artman, et al 2001). Burning may also create a more open understory, creating conditions favored by ovenbirds. Thinning, midstory treatments, and burning would allow more sunlight into treated areas, increase insect production, and improve/maintain foraging habitat (NatureServe 2012).

Other proposed activities including post-harvest treatments, group selection, crop tree release, wetland improvements, tree planting, nest/bat box installation, waterhole construction, drumming logs, and other road activities (maintenance, reconstruction, decommission, and authorization) would not occur in suitable habitat or create habitat, and would have no effect on ovenbirds.

Although ovenbird habitat would be altered in the Paint Creek watershed, the amount of habitat available across the analysis area would remain sufficient to support the species' breeding requirements. Because the activities occur over an extended period of time (years), and are scattered across the watershed, the alternatives (Table 3ff) may have localized negative impacts.

Table 3ff: Acres of Ovenbird Habitat Impacted by Activity and Alternative

Activity	Alternative		
	B	C	D
ESF	349	190	349
Thinning	122	170	122
Midstory	95	62	491
Pre-harvest treatments	471	360	284
Road construction	1	2	2

Pileated woodpecker would be directly impacted by the alternatives. Harvest (ESF, thinning, and group selection), road construction, and prescribed burning during the breeding season may disrupt nesting behavior, but pileated woodpeckers are relatively tolerant of human disturbance around nest sites (Bull and Jackson 1995). Although snags would be protected from cutting, mortality of young may occur if a nest tree is hit by a falling tree. Because implementation would occur over time, and not all at once, impacts to the species would be short term. Impacts would be considered minor in context of the surrounding landscape where suitable habitat is abundant.

Nesting habitat would be impacted in harvested areas (ESF, thinning, and group selection). The decrease in canopy closure and the loss of most large live trees as a result of harvest would reduce the quality of nesting habitat (Bull and Jackson 1995). Pileated woodpecker densities increase with closed canopy and high density of trees (NatureServe 2012). The implementation of RLRMP standards regarding snag retention and den trees would provide some protection. Remaining snags and den trees, particularly in thinning and group selection areas would continue to provide habitat. The resulting damage to the trees left standing after harvest may create additional snags in the future. Streamside forests, important for nesting (ibid, would be protected by RLRMP standards for riparian forests.

Prescribed fire generally burns in a mosaic pattern, with some areas burning completely while others little to none, particularly in moist coves and riparian forests. Although prescribed fire may eliminate some nesting trees, fire would also create new snags, providing additional nesting habitat. New snags are needed over time as old snags fall.

This species commonly forages in younger forests, so they would continue to use stands after harvest. Standing snags, stumps, logs, and logging slash left after harvest, crop tree release, and wetland improvements are also important foraging substrates. Installation of drumming logs would also increase foraging habitat. Small snags would be created in the midstory treatments and also in harvested areas. These changes would increase foraging opportunities for the pileated woodpecker. Foraging habitat (decaying wood) in streamside forests is important foraging habitat (NatureServe 2012) and would be protected by RLRMP standards for riparian forests. Studies in western forests have shown that pileated woodpeckers and one of their main food sources (ants) are less abundant in burned areas (Bull et. al. 2005). Fire in the Southern Appalachians generally leaves moist habitat burned in patches. New snags created by burning would also provide additional forage. Suitable habitat would remain within the burned areas and habitat conditions may be improved.

Other proposed activities including tree planting, nest/bat box installation, waterhole construction, drumming logs, and other road activities (maintenance, reconstruction, decommission, and authorization) would not occur in suitable habitat or create habitat, and would have no effect on pileated woodpeckers.

Although pileated woodpecker habitat would be altered in the Paint Creek watershed, the amount of habitat available across the analysis area would remain sufficient to support the species' breeding requirements. Impacts from the alternatives (Table 3gg) would not negatively influence the population trends in the analysis area.

Table 3gg: Acres of Pileated Woodpecker Habitat Impacted by Activity and Alternative

Activity	Alternative		
	B	C	D
ESF	377	213	377
Thinning	152	203	152
Group selection	0	0	32
Midstory	95	84	491
Pre-harvest treatments	529	416	529
Wetland Improvements	2	25	36
Road construction	1	3	3

Cumulative Effects of Alternatives B, C and D

Alternatives B, C, and D would have a positive cumulative effect on *prairie warbler* habitat by increasing the amount of habitat in the analysis area. Past burning and thinning have created habitat in the last 10 years. Small patches of ESF habitat may be created by future prescribed

burning and natural disturbances. By providing a shifting mosaic of low elevation ESF, the alternatives would help lessen the negative population trend of prairie warbler in the analysis area and ensure the species' viability across the CNF.

Alternatives B, C, and D would have a positive cumulative effect on *chestnut-sided warbler* habitat by increasing the amount of habitat for the species in the analysis area. Because no HESF has been created in the last 10 years, no past activities would be cumulative with the proposed creation of HESF. Small patches of HESF may be created by future prescribed burning and natural disturbances. By providing a shifting mosaic of HESF, the alternatives would help lessen the negative population trend of chestnut-sided warbler in the analysis area and ensure the species' viability across the CNF.

Alternatives B, C, and D would have a slight adverse cumulative effect on *Acadian flycatcher, hooded warbler, pine warbler, scarlet tanager,* and *pileated woodpecker* habitat within the analysis area. Past thinning and past and future burning would have the same effects as discussed previously. Suitable habitat would continue to be abundant and widespread. Populations are likely to continue on a positive trend and the alternatives would not threaten the viability of these species across the CNF.

Alternatives B, C, and D would have an adverse cumulative effect on *ovenbird* within the analysis area. Past and future burns planned for the area, along with past thinning, would have detrimental effects. The past, proposed, and future activities combined would impact ovenbird habitat throughout the analysis area. Because these activities would occur over a long time period and many of the impacts would be short term, habitat would remain abundant in the analysis area. Populations would persist, so these negative cumulative effects would not contribute to the decline of this species or its habitats across the CNF.

Demand Species

Table 3hh lists demand species considered in the analysis. Current trend data for the species on the CNF is not available. Trend data (2001-2011) for black bear in Tennessee was gathered from the TWRA Big Game Harvest Report (Yoest et al. 2012). Trend data for grouse in Tennessee is not available; trend is determined from local expertise, habitat availabililty, and surveys.

Table 3hh: Demand Species of the Paint Creek Analysis Area

Demand Species	Key Habitat Available - Acres (%)	Population Trend - TN
Black bear	Denning - 12,592 (79%); Foraging - 8,332 (52%)	Increase
Ruffed grouse	Nesting - 1,826 (11%); Brood rearing - 254 (2%)	Decline

Effects Analyses of the Alternatives

Alternative A (No Action)

Direct and Indirect Effects

Under Alternative A, *black bear* denning habitat and hard mast availability would not be affected. Early successional habitat that provides spring and summer forage in the form of soft-mast, e.g. berries, would continue to be limited in the analysis area and would decline over the next decade. Habitat diversity, especially for foraging, would decline as late successional forests further dominate the landscape. The absence of early successional foraging habitat may cause bears to seek more suitable forage on private land. Overall, the bear population would remain stable or increase.

Ruffed grouse habitat would continue to decline over the next 20 years as ESF and SPF mature. Sapling pole forests are essential ruffed grouse nesting and adult cover habitat. Early successional forests used for brood rearing habitat are extremely limited in the analysis area and would remain so in the future.

Cumulative Effects

The No Action alternative would have no cumulative effects on *black bear* and *ruffed grouse* because any action would be deferred and would not be cumulative with other activities in the analysis area. Populations would continue on their current trends (see Table 3hh).

Alternatives B, C, and D

The types of effects on MIS would be the same for Alternatives B, C, and D. Only the size and magnitude of the effects would differ, so the alternatives will be addressed together.

Impacts Common to All Species

Pre and post-harvest, midstory treatments, and wetland improvements would require herbicides, but only a portion of the acres treated would be directly impacted. The herbicides used are unlikely to contact MIS and demand species directly, but may be present on food sources that are ingested (plants and insects). They are of low toxicity to mammals and birds (Tu et al 2001). The following factors would minimize the risk of contamination: 1) herbicide applied in small amounts; 2) specific methods of application such as thinline or stump treatments; 3) design criteria for herbicide use, e.g. timing to avoid rainfall; 4) stream buffers would protect riparian habitats; 5) bears and birds are highly mobile and are able to leave the areas during treatment.

Direct and Indirect Effects

Black bear would be directly impacted by the alternatives. Bear activity and movement patterns may be altered during project implementation in order to avoid humans. However, bears are highly mobile and would continue to utilize the areas during and after implementation. Impacts would be considered minor and short term in context of the surrounding landscape where suitable habitat is abundant. Prescribed burning may directly impact black bears in the burn areas. Fire would cause bears to relocate if possible, but cubs may not be able to escape the fire, and may perish.

Harvesting (ESF, thinning, and group selection) and burning would alter denning habitat in late successional forests. Potential den trees would be protected from harvest according to RLRMP Standards, so impacts to denning habitat would be minor. Bears may also den in brush piles created from logging slash left after harvest. Burning may also create future den trees.

ESF creation would greatly reduce hard mast production areas in harvested areas, but thinning and group selection would have less impact. Soft mast production and cover would increase in harvest, wetland improvement, and crop tree release areas, providing habitat for feeding and loafing. Midstory treatments would encourage mast production and provide better quality winter foraging habitat and would promote future hard mast production. Burning would be beneficial by increasing open conditions and soft mast production. Waterholes construction would provide water sources in drier areas and create additional forage in the form of wetland plants, insects, and other animals.

Habitat remoteness would be impacted during road construction, but the roads would be closed after use, so impacts would not last beyond implementation. Decommissioning would add to habitat remoteness, particularly in the Rough Branch/Cutshall Bog area where bear hunting is allowed. Road maintenance and reconstruction would improve opportunities for hunting and viewing of this species by the public, although much of the watershed is in a bear reserve.

Other proposed activities including tree planting, nest/bat box installation, and road authorization would not occur in suitable habitat or create habitat, and would have no effect on black bears.

The vegetation management and burning in the alternatives (Table 3ii) would increase the structural diversity in the area, as well as the variety of food sources and denning habitat. This would provide better year-round conditions because individuals would have less distance to travel and more habitats available for their seasonal requirements. During the spring and summer, bear activity may increase within the analysis area due to the enhancement and production of forage and an increase in habitat diversity. These activities would improve hunting and wildlife viewing opportunities for the public. The black bear population trend would continue to be positive.

Table 3ii: Acres of Black Bear Habitat Impacted by Activity and Alternative

Activity	Alternative		
	B	C	D
ESF	377	287	398
Thinning	152	203	152
Group selection	0	0	103
Midstory	95	84	513
Pre-harvest treatments	529	490	284
Wetland Improvements	2	25	36
Road construction	1	3	3

Ruffed grouse may be directly impacted by crop tree release, post-harvest treatments, and burning. If implemented during breeding season, these activities may disrupt nesting behavior, potentially causing mortality of young in the nest. Mortality would be likely if nests are trampled, crushed, or burned. Implementation would occur over a long period of time, and would be short term and on a small scale.

Currently, habitat for this species is scarce in the analysis area. Brooding, roosting, and feeding habitat would increase due to the creation of ESF, thinning, and group selection (Table 3jj). Prescribed burning might also provide some ESF if small pockets burn more intensely and kill some of the overstory. Insect production would increase from the more open habitat conditions created by harvest. This would provide feeding and brood rearing habitat for the next 10 years. After the ESF matures to SPF, these areas would provide ideal hiding and breeding cover for ruffed grouse.

Crop tree release and wetland improvements in existing habitat may improve open conditions, making habitat more suitable for nesting and foraging, and may extend the period of occupation in those stands. Midstory treatments may improve foraging conditions slightly. Construction of waterholes would provide water sources in drier areas. Insect, plant, and seed production from the wetland edges of the waterholes would supply additional forage.

Installation of drumming logs would provide places for males to drum during breeding season. This may improve reproduction in those areas. Road maintenance would improve opportunities for hunting and viewing of this species by the public. Other proposed activities including pre-harvest treatments, tree planting, nest/bat box installation, and other road activities (decommission and authorization) would not occur in suitable habitat or create habitat, and would have no effect on ruffed grouse.

Improvements across the analysis area would provide brood rearing and foraging habitat that is currently missing. The alternatives (Table 3jj) would also improve habitat conditions and diversity across the landscape and ensure the continuation of essential habitat requirements for grouse. These improvements would contribute to a local population increase. Creation of ESF would also ensure the continuation of ruffed grouse hunting and viewing opportunities.

Table 3jj: Acres of Ruffed Grouse Habitat Impacted by Activity and Alternative

Activity	Alternative		
	B	C	D
ESF	377	287	398
Thinning	152	203	152
Group selection	0	0	103
Midstory	0	22	22
Crop tree release	674	49	674
Post-harvest treatments	529	490	284
Road construction	1	3	3

Cumulative Effects

Alternatives B, C, and D would have a positive cumulative effect on *black bear*. Past and future prescribed burning and past thinning would also improve habitat conditions for bears. Burning would improve conditions for ground foraging and would increase sunlight, plant, and insect production. These combined activities would increase habitat diversity and food sources in the analysis area. By continuing to provide a diverse forested landscape, black bear populations would continue on their positive trend. The alternatives would ensure the viability of this species across the CNF.

Alternatives B, C, and D would have a positive cumulative effect on the availability of *ruffed grouse*. Past and future prescribed burning and past thinning would improve conditions for ground foraging by increasing sunlight, plant, and insect production. Burning may also create small patches of ESF. These activities combined would increasing and maintain the amount of brood-rearing habitat and ensure the continuation of nesting habitat (SPF) over the long term in the analysis area. By maintaining and increasing the availability of quality habitat, the alternatives would improve the negative population trend of ruffed grouse in the analysis area and ensure its viability across the CNF.

Rare Species

Scope of Analysis

The analysis area (AA) for available habitat, direct, indirect, and cumulative effects on terrestrial resources is the Paint Creek watershed. Affected areas include Compartments 205, 206, 207, 209, 210, 213-219, 223, 262, and 264. The analysis includes both suitable and unsuitable acres. The timeframe for cumulative effects is the previous five years through five years after completion of the work. Other activities in the area of consideration are listed in Table 3kk. The time frame is consistent with advice given by the U.S. Fish and Wildlife Service.

Table 3kk. Other Activities Considered in Rare Species Cumulative Effects Analysis

Activity	Acres	Past 5 years	Future 5 Years
Henry Ridge Prescribed Burn	28	Yes	No
Phillips Hollow Prescribed Burn	15	Yes	No
Bellcow Mountain Prescribed Burn	1,818	No	Yes
Paint Creek Hemlock Treatments	10	Yes	Yes
Hurricane Gap Hemlock Treatments	1	Yes	Yes
Ricker Mountain Hemlock Treatments	1	Yes	Yes
Wildfires/floods	unknown	Yes	Yes

Species

Twenty animal and 16 plant species found on the CNF Species Viability List (CNF 2004a) have been detected or have habitat within affected areas (Table 3ll). The status, distribution, and habitats for Threatened and Endangered species are discussed in more detail in the *Biological Assessment for Paint Creek Project* (Carter 2013). Sensitive species are also addressed in more

detail in the *Biological Evaluation for Paint Creek Project* (Carter and McGuiness 2013). Additonal information on rare plants can be found in *Paint Creek Rare Plant Analysis by Survey Site* (McGuiness 2013).

Table 3ll. Rare Species and Habitats* in Analysis Area

Scientific Name	Common Name	Status[1]	High Elevation (>3000 ft)	Canopy Gaps	Dry Forests	Mesic Forests	Riparian Wetland	Cliffs Rocks
Amphibians/Fish/Reptiles								
Desmognathus carolinensis	Carolina mountain dusky salamander	S						
Mammals								
Corynorhinus rafinesquii	Rafinesque's big-eared bat	S						
Myotis grisescens	Gray bat	E						
Myotis leibii	Eastern small-footed bat	S						
Myotis sodalis	Indiana bat	E						
Birds								
Caprimulgus vociferus	Whip-poor-will	VC						
Corvus corax	Common raven	VC						
Limnothlypis swainsonii	Swainson's warbler	VC						
Invertebrates								
Mesomphix latior	Broad button (snail)	VC						
Mesomphix rugeli	Wrinkled button (snail)	VC						
Mesomphix subplanus	Flat button (snail)	VC						
Paravitrea lamellidens	Lamellate supercoil (snail)	VC						
Paravitrea placentula	Glossy supercoil (snail)	S						
Paravitrea tridens	White-foot supercoil (snail)	VC						
Stenotrema altispira	Highland slitmouth (snail)	VC						
Ventridens coelaxis	Bidentate dome (snail)	S						
Ventridens decussatus	Crossed dome (snail)	VC						
Ventridens lasmodon	Hollow dome (snail)	VC						
Ventridens lawae	Rounded dome (snail)	VC						
Speyeria diana	Diana fritillary (butterfly)	S						
Plants (vascular)								
Buckleya distichopyhlla	Piratebush	S						
Caltha palustris	Marsh marigold	VC						
Campanula aparinoides	Marsh bellflower	VC						
Carex platyphylla	Broadleaf sedge	VC						
Carex scabrata	Rough sedge	VC						
Chrysoplenium americanum	Golden saxifrage	VC						
Eupatorium steelei	Steele's Joe-pye-weed	VC						
Heuchera longiflora var. aceroides	Maple-leaf alumroot	S						

Scientific Name	Common Name	Status[1]	High Elevation (>3000 ft)	Canopy Gaps	Dry Forests	Mesic Forests	Riparian Wetland	Cliffs Rocks
Isotria verticillata	Large whorled pogonia	VC	■	■		■	■	
Listera smallii	Kidney-leaf twayblade	VC	■			■	■	
Orontium aquaticum	Golden club	VC					■	
Pedicularis lanceolata	Swamp lousewort	VC					■	
Platanthera psychodes	Small purple-fringed orchid	VC	■	■		■	■	
Thermopsis mollis var. fraxinifolia	Ashleaf goldenbanner	S	■	■	■			
Trillium undulatum	Painted trillium	VC	■			■	■	
Xerophyllum asphodeloides	Eastern turkey beard	VC	■	■	■			

* Dark blocks indicate habitat(s) use by species.

[1] Status: E-Endangered; S-Sensitive; VC-Viability Concern: LR-Locally Rare

Effects Analyses of the Alternatives

Animals

Alternative A (No Action)

Direct and Indirect Effects

Whip-poor-will breeding habitat and populations would decrease in the analysis area due to absence of ESF and reduction of SPF in the next 20 years. Habitats for and populations of *common raven* and *Diana fritillary* would continue to decline over the next five years as forests mature to later successional stages, reducing habitat diversity.

Habitats for and populations of *Carolina mountain dusky salamander; Rafinesque's big-eared, gray, eastern small-footed,* and *Indiana bats; Swainson's warbler; broad, wrinkled,* and *flat button; lamellate, glossy,* and *white-footed supercoil; highland slitmouth; bidentate, crossed, hollow,* and *rounded dome* would not be impacted because the actions would be deferred.

Cumulative Effects

This alternative would have no cumulative effects on *Carolina mountain dusky salamander; Rafinesque's big-eared, gray, eastern small-footed,* and *Indiana bats; whip-poor-will, Swainson's warbler, common raven; Diana fritillary; broad, wrinkled,* and *flat button; lamellate, glossy,* and *white-footed supercoil; highland slitmouth; bidentate, crossed, hollow,* and *rounded dome* because any action would be deferred and would not be cumulative with other activities in the analysis area.

Alternatives B (Proposed Action), C and D

The types of effects to rare animal species would be the same for Alternatives B, C, and D. Only the size and magnitude of the effects would differ, so the alternatives will be addressed together. Activities would not put the viability of any rare species at risk on the CNF.

Direct and Indirect Impacts

Activities would not put the viability of any rare species at risk on the CNF.

Pre and post-harvest, midstory treatments, and wetland improvements would require herbicides, but only a portion of the acres treated would be directly impacted. The herbicides used are unlikely to contact rare animal species directly, but may be present on food sources that are ingested (plants and insects). They are of low toxicity to mammals and birds (Tu et al 2001) and present low risk to aquatic species (SERA). The impacts of herbicides on amphibians and reptiles are unknown. The following factors would minimize the risk of contamination: 1) herbicide applied in small amounts; 2) specific methods of application such as thinline or stump treatments; 3) design criteria for herbicide use, e.g. timing to avoid rainfall; 4) stream buffers would protect riparian habitats.

Carolina Mountain dusky salamander is known to occur in the analysis area and would be directly affected by these alternatives. Individuals may be injured or destroyed during road maintenance, road construction, and harvest activities (ESH creation, group selection, and thinning), particularly during tree felling and moving soil with heavy equipment. Direct effects would be short-term, occurring only during the duration of the activities and on a small scale. Mountain dusky salamanders concentrate in riparian forests, where activity would be minimal. Stream filter zones would protect the majority of individuals from harm.

Fire line construction in moist habitats may cut or crush some individuals, although these impacts would be minimal. Removal of downed trees across fire lines where salamanders are located would cause them to relocate away from the line. During drier periods, salamanders are likely to be under logs, moist leaf litter in coves and riparian areas. Low intensity burns in moist habitats do not consume large woody debris. Fire generally burns in a mosaic pattern; leaving much of the cove forests untouched. Therefore most individuals would be protected from direct effects of the fire.

Harvesting (ESH, group selection, and thinning) within coves would increase sunlight to the forest floor causing leaf litter dry-out and increased surface temperatures. This may cause salamanders to relocate to more moist conditions in adjacent stands. Riparian zones, leave areas, logging slash, and remaining LWD would provide protection within harvested areas. Home ranges of salamanders tend to be very small, on the order of a few to a few dozen meters in diameter. Yet, on occasion, they may travel at least several hundred meters (NatureServe 2012), which would be outside of the affected area. Additional habitat would remain undisturbed in adjacent areas within an acceptable travel distance. Over time, canopy cover would increase to more suitable conditions again and the salamanders should return to the area. Salamanders are known to recolonize a clear-cut over 4-15 years and reach pre-harvest levels in up to 20 years (Ash 1997).

Only a small amount of habitat would be lost where road construction occurs. Midstory treatments, crop tree release, and wetland improvements would still allow shaded conditions and would not affect habitat to any degree. The addition of grouse drumming logs would improve habitat conditions in the future. Road decommissioning would return a small portion of suitable

habitat to more suitable conditions. Waterhole construction may provide a small amount of habitat in drier areas.

Prescribed burns would be of low intensity and patchy with minimal impacts to Carolina mountain dusky habitat. Unburned patches would continue to provide leaf litter, logs, and rock habitats within the affected areas. In burned patches, some large downed wood usually remains in low intensity burns. Leaf litter and food availability would temporarily decline within the burn units, but the forested landscape of the project area would remain. Another layer of leaf litter would return the following year. These impacts would be short-term for the population which would persist in the area. Habitat is scattered throughout the analysis area, and the majority of the populations would not be impacted.

Tree planting, nest/roost boxes, and authorizing existing roads would have no impact on Carolina mountain dusky salamanders. Although habitat would be altered in the Paint Creek watershed, the small amount impacted and the large amount available across the analysis area would remain sufficient to support habitat requirements. Impacts from these alternatives (Table 3mm) would not negatively influence the population trends in the analysis area.

Table 3mm: Acres of Carolina Mountain Dusky Salamander Habitat Impacted by Activity and Alternative

Activity	Alternative		
	B	C	D
ESF	33	33	33
Thinning	10	15	10
Group selection	0	0	3
Midstory	5	5	10
Pre-harvest treatments	43	48	43
Wetland Improvements	2	25	36
Road decommission	1	2	2

Gray bat would not be directly affected. Habitat associated with caves would not be impacted because no caves are located within the watershed. Hibernacula and maternity colony habitat would not be affected. Activities would occur during the day while bats are roosting in caves and are absent from the project area.

Six early successional, two thinning, two group selection, eight midstory, and 13 crop tree release stands are adjacent to small streams that are typically choked with rhododendron or other vegetation. These streams would not be suitable foraging habitat for gray bat. Riparian zone restrictions (no harvest within 100 feet of perennial streams) and streamside buffer zones (no herbicide or ground disturbance) would protect foraging habitat from changes to vegetation and water quality. Activities in other stands would have no indirect effects on gray bay.

Prescribed burning would have no direct impacts on gray bat because they would not be present during burning. Burns would be conducted in fall/winter/early spring when gray bats are still in hibernation. Fire would be ignited along the upper slopes, backing down toward riparian corridors. Fire in riparian corridors is often patchy or goes out when it reaches the moist

conditions in these areas. Burns would have indirect beneficial impacts for gray bat by increasing the light intensity in the understory which in turn increases insect production. The increase in insect production would provide better foraging opportunities for gray bat.

Road maintenance, decommissioning, obliteration, recontouring, and wetland restoration would improve water quality along Paint Creek where gray bats may forage. Road authorization, temporary road construction, tree planting, nest boxes, waterhole construction, and grouse drumming log installation would have no effect on gray bat.

Impacts from the alternatives (Table 3nn) would not negatively influence gray bats in the analysis area.

Table 3nn: Acres of Gray Bat Habitat Impacted by Activity and Alternative

Activity	Alternative		
	B	C	D
ESF	33	33	33
Thinning	10	15	10
Group selection	0	0	3
Midstory	5	5	10
Pre-harvest treatments	43	48	43
Wetland Improvements	2	25	36
Road decommission	1	2	2

Indiana bat is not likely to be affected. There are no known hibernacula on the CNF, no caves are present in the project area, and no Indiana bats have been found on the North End of the CNF. Should an Indiana bat roost site be discovered prior to and/or during project implementation, project activities would stop, and the CNF would again consult with the FWS.

The proposed project would indirectly affect Indiana bat by alteration of roosting and foraging habitat. Removal of trees during early successional activities, thinning, group selection, temporary road construction, and road obliteration would contribute to the loss of future roosting habitat. However, Indiana bats have adapted to these types of situations as roost trees are temporary in nature (O'Keefe 2011). The 15-20 basal area per acre (BA) remaining in early successional areas and 35-60 BA in the thinned area would ensure that roosting habitat would continue to be available in harvested stands over the next five years. The RLRMP requires the largest trees with favorable conditions for roosting bats to be left. It also requires retention of all shagbark hickory trees (>6 inch diameter) and snags with exfoliating bark. New snags would develop from trees damaged during harvest, creating roosting habitat in the future. Installation of bat boxes would also provide additional roosting habitat. The overall effect of these activities would provide open patches of forest with standing snags for roosting. The open condition of these areas would make roosting habitat more suitable by providing more sunlight to maintain warmer conditions in the roost.

Creation of early successional habitat, thinning, group selection, midstory, and crop tree release would increase light intensity and herbaceous plant diversity for the next five to ten years. These

activities would increase insect production and improve forage conditions for bats. Construction of vernal ponds would supply upland water sources and improve foraging conditions.

Dormant season burning would have no direct effects on Indiana bats because burning would take place when bats are not present. However, foraging, roosting, and maternity colony habitat may be altered. Prescribed fire over a large area generally burns in a mosaic pattern, with some areas burning completely while others little to none, particularly in moist coves. Although prescribed fire activities may eliminate some potential roosting and maternity colony snags or live trees, fire would also create new snags, providing additional roosting habitat. New snags are needed over time as old snags deteriorate and lose sloughing bark. Since roost trees are ephemeral, bats are adapted to finding new roost trees should roosts be lost during a fire.

Burns would have indirect beneficial impacts for Indiana bat by increasing the herbaceous layer in the understory which in turn increases insect production. The increase in insect production would provide better foraging opportunities for Indiana bat. Suitable habitat would remain within the burned area and habitat conditions would be improved.

Road maintenance, decommissioning, obliteration, recontouring, and wetland restoration would improve water quality along Paint Creek where bats may forage. Road authorization, temporary road construction, tree planting, nest boxes, waterhole construction, and grouse drumming log installation would have no effect on Indiana bat.

Although Indiana bat habitat would be altered in the Paint Creek watershed, the habitat available across the analysis area would remain sufficient to support the specie's habitat requirements. Impacts from the alternatives (Table 3oo) would not negatively influence Indiana bat habitat.

Table 3oo: Acres of Indiana Bat Habitat Impacted by Activity and Alternative

Activity	Alternative		
	B	C	D
ESF	377	213	377
Thinning	152	203	152
Group selection	0	0	32
Midstory	95	84	491
Pre-harvest treatments	529	416	529
Wetland Improvements	2	25	36
Road construction	1	3	3

Eastern small-footed bat and ***Rafinesque's big-eared bat*** have been found in or near the analysis area. Maternity roosts are not likely to be disturbed because harvesting would not occur near rock outcrops, caves, or mines. Any impacts would be short term, only lasting through the duration of the activities. Other direct, indirect, and cumulative effects to small-footed bats would be the same as for Indiana bat.

Common raven may be directly impacted. Individuals may be disturbed during harvest (ESF, thinning, group selection), road construction, and burning. They would likely move from the area of disturbance. Because these birds nest on cliffs or in conifers at high elevations, nesting habitat would not be disturbed.

The creation of waterholes would provide additional water sources in areas where water is generally lacking. Ravens are opportunistic feeders (NatureServe 2012) utilizing a variety of habitats. Midstory treatments, pre and post-harvest treatments, wetland improvements, and burning would increase habitat diversity in the Paint Creek watershed. Open forest conditions, increased habitat diversity, and the improved conditions for fruits, seeds, and small mammals would increase forage for these species, especially the common raven.

Proposed activities including tree planting, nest/bat box installation, drumming logs, and road activities (decommission, maintenance, and authorization) would not occur in suitable habitat or create habitat, and would have no effect on ravens. Raven populations would persist in the area.

The vegetation management and burning in the alternatives (Table 3pp) would increase the structural diversity in the area, as well as the variety of food sources. Effects to raven population trend would be positive.

Table 3pp: Acres of Raven Foraging Habitat Impacted by Activity and Alternative

Activity	Alternative		
	B	C	D
ESF	377	287	398
Thinning	152	203	152
Group selection	0	0	103
Midstory	95	84	513
Pre-harvest treatments	529	490	284
Wetland Improvements	2	25	36
Road construction	1	3	3

Whip-poor-will may be directly impacted by crop tree release and post-harvest treatments. If implemented during breeding season, these activities may disrupt nesting behavior, potentially causing mortality of young in the nest. Mortality would be likely if trees with nests are cut. Prescribed burning would occur during months when whip-poor-wills have migrated to their winter habitat.

Currently, habitat for this species is scarce in the analysis area. Foraging and nesting habitat would become available by the creation of low elevation ESF. Without naturally occurring fires, active management is necessary to create the ESF required and to maintain a mosaic of different successional stages (NatureServe 2012). Thinning and group selection may also provide small pockets of ESF for whip-poor-will. Harvest and post-harvest treatments in these areas would ensure the continued existence of habitat and population increases. Prescribed burning in the all burn units may provide some ESF if small pockets burn more intensely and kill some of the overstory. Crop tree release in existing habitat may improve open conditions, making habitat more suitable for nesting and foraging, and may extend the period of occupation in those stands.

These alternatives would provide habitat that is currently missing in the Paint Creek watershed. They would contribute to a local population increase and contribute to stability and continuation of populations on the CNF.

Midstory treatments, wetland improvements, tree planting, nest/bat box installation, waterhole construction, drumming logs, and road activities (maintenance, reconstruction, construction, decommission, authorization) would not occur in suitable habitat or create habitat, and would have no effect on whip-poor-wills.

These alternatives (Table 3qq) would provide habitat that is currently missing in the Paint Creek watershed. They would contribute to a local population increase and contribute to stability and continuation of populations on the CNF.

Table 3qq: Acres of Whip-poor-will Habitat Impacted by Activity and Alternative

Activity	Alternative		
	B	C	D
ESF	337	287	398
Thinning	152	203	152
Group selection	0	0	103
Crop tree release	674	49	674
Pre & post-harvest treatments	489	490	550

Swainson's warbler may be negatively impacted from activities (harvest, road work, midstory treatments, wetland improvements, and road decommissioning) occurring within suitable habitat. Disruption of breeding and foraging behavior could occur during breeding season. These impacts would be extremely minor and short term. Because nests are typically built along the stream edge which is protected by riparian zone standards (RLRMP - no cutting along streams), nests would not be directly impacted. Prescribed burning would occur during months when warblers have migrated to their winter habitat.

Habitat would mostly be protected by riparian zones; however, some habitat on the outside edges of those zones may be used by these birds. The creation of ESF, thinning and group selection would create canopy gaps, increasing the shrub component that is essential for nesting. Group selection or small, patchy clear-cuts are recommended to improve marginal Swainson's warbler habitat. Populations are known to occur in 15 year old clear-cuts and pole forests (Meyer 2006, NatureServe 2012). Although these birds inhabit ESF, they are more abundant in mature forests with a dense canopy and rhododendron understory (NatureServe 2012). Breeding birds may move to adjacent areas with suitable habitat or they may nest within the harvested areas. Mature MDF in adjacent areas and streamside management zones within harvested areas (with dense shrub components) would continue to provide ideal nesting habitat for the species.

Burning is not likely to have a measurable effect on Swainson's warbler habitat. As fire backs down from the ridges, it usually goes out before it reaches the riparian areas. If it does continue to burn, it is of a very low intensity, usually burning only the leaf litter. More intense burning on

the upper slopes may burn rhododendron more intensely. Pre- and post-harvest treatments and midstory treatments, along with burning, may temporarily reduce nesting habitat suitability by reducing shrub layer density in the first year or two after treatment. However, these improvements may stimulate understory growth, promoting the return of a thicker shrub layer over time. ESF creation, midstory treatment, crop tree release, and wetland improvements would increase sunlight and insect production in treated areas, improving foraging habitat.

Tree planting, nest/bat box installation, waterhole construction, drumming logs, and other road activities (maintenance, reconstruction, decommission, and authorization) would not occur in suitable habitat or create habitat, and would have no effect on Swainson's warblers.

Although Swainson's warbler habitat would be altered in the Paint Creek watershed, the small amount of habitat impacted and the large amount of habitat available across the analysis area would remain sufficient to support breeding requirements. Impacts from these alternatives (Table 3rr) would not negatively influence the population trends in the analysis area.

Table 3rr: Acres of Swainson's Warbler Habitat Impacted by Activity and Alternative

Activity	Alternative		
	B	C	D
ESF	33	33	33
Thinning	10	15	10
Group selection	0	0	3
Midstory	5	5	10
Pre-harvest treatments	43	48	43
Wetland Improvements	2	25	36
Road decommission	1	2	2

Diana fritillary adults and caterpillars may be directly impacted by the alternatives. Road construction, tree felling, and skidding (ESH creation, group selection, and thinning) may damage or destroy caterpillars on the ground and/or adults roosting in trees. These direct effects would be short-term, occurring only during the duration of the activities and would be limited to the action areas. Stream filter zones would protect individuals in riparian areas from harm.

Diana larvae would be hibernating in the moist cove forests when burning is implemented. Fire generally burns in a mosaic pattern; leaving much of the cove forests untouched. A portion of the population of larvae in cove forests could be directly impacted by burning. The remaining individuals within and adjacent to the burned areas would repopulate the area over time, but it is not known how long that would take.

This alternative would indirectly affect caterpillar habitat. Harvesting (ESH, thinning, and group selection) in mature MDF would increase sunlight to the forest floor, decreasing conditions for the growth of violets, the host plant for the species. As the forest regenerates and post-harvest treatments thin re-growth, host plant habitat conditions would become more favorable within five years. However, conditions may not be optimal until the forest matures. Crop tree release, midstory treatments, and wetland improvements would still allow for shaded conditions for

caterpillars or their host plant. Only a small amount of caterpillar habitat would be destroyed due to waterhole construction and road construction. Road decommissioning would return a small portion of suitable habitat to more suitable conditions.

The increased sunlight from harvesting would be beneficial for nectaring adults by increasing the growth of flowering plants for five to ten years post-harvest. Crop tree release, midstory treatments, and wetland improvements may encourage flowering plant abundance and diversity for nectar gathering. Although burning would have negative direct effects, this management would also have beneficial indirect effects. In some areas more open conditions would make conditions more suitable for Diana breeding habitat. Burning would also improve foraging habitat for adult Diana by increasing light conditions and flower production (NatureServe 2012).

Road maintenance, authorization, tree planting, nest/roost boxes, and grouse log installation would have no impact on Diana fritillary. The alternatives (Table 3ss) would maintain a diverse forested landscape and would ensure that the viability of the Diana population on the CNF.

Table 3ss: Acres of Diana Fritillary Habitat Impacted by Activity and Alternative

Activity	Alternative		
	B	C	D
ESF	215	190	215
Thinning	69	101	69
Midstory	95	62	326
Crop tree release	527	49	527
Pre & post-harvest treatments	284	291	284
Wetland Improvements	2	25	36
Road construction	0	1	1

Broad, wrinkled, and ***flat button****;* ***lamellate, glossy,*** and ***white-footed supercoil****;* ***highland slitmouth****;* ***bidentate, crossed, hollow,*** and ***rounded dome*** may be directly impacted (relocated or crushed) during harvest (ESF, thinning, and group selection), road construction, road construction, and waterhole construction, particularly during tree felling and moving soil with heavy equipment. Any effects would be short term, occurring only during the activities and limited to the activity area. Individuals in underground retreats, at the base of trees, and under large logs would be protected from direct impacts. Compliance with RLRMP standards, including the stream filter zones, would protect individuals in riparian areas from harm.

Fire line construction may crush some snails; others would be able to relocate. Snails are most abundant in the humus layer, leaf litter, rocks, and wood on the forest floor (Burch and Pearce 1990). Because these species occur within leaf litter, some mortality could occur as a result of the burning. However, during dry periods (suitable for burning) most would remain in the humus or the moist bottom layer of the leaf litter (Royal BC Museum 2006) or under logs and rocks. Low intensity fire generally burns in a mosaic pattern; leaving much of the cove forests untouched. Moist leaf litter generally does not burn and fire does not consume the majority of large woody debris, so refuge such as large logs and rocks would remain. These refuges are the most important habitat component and the main limiting factor for their success. If individuals

are lost, remaining ones would be capable of repopulating as they are hermaphrodites and can fertilize themselves (Burch and Pearce 1990).

Negative and long-term indirect effects would occur in potential habitat. Harvest (ESH, thinning, and group selection) would increase sunlight to the forest floor causing leaf litter to dry out, and increased surface temperatures. This may cause snails to relocate to more moist conditions in adjacent stands. However, snails are able to survive dry periods, sometimes for years (Burch and Pearce 1990). Habitat would remain in harvested areas in the form of underground retreats, slash piles, and logs. By protecting them from dry conditions and predators, refugia are the most important limiting factor for these animals (Burch and Pearce 1990). Over the years, canopy cover would increase to more suitable conditions, and the snails should return to the area.

Where complete burning of the leaf litter does take place, habitat conditions would temporarily become unfavorable. The loss of their protective cover would result in movements to unburned areas, exposing snails to predation. Snails are not able to move quickly or over much distance, and do not generally move around except to find food and for reproduction (NatureServe 2012). The unburned patches would continue to provide habitat within the affected areas. Another layer of leaf litter would return the next autumn. Burning does not greatly reduce snail diversity (Royal BC Museum 2006), and small snails have been found in previously burned areas on the CNF. These impacts would be short-term and populations would persist in the areas.

Only a small amount of habitat would be lost where road construction occurs. Road maintenance would have some beneficial indirect effects; the addition of limestone gravel on the roads would provide an additional source of calcium for shell production (Burch and Pearce 1990). After implementation, the snails would use the areas again. Midstory treatments, crop tree release, and wetland improvements would still allow shaded conditions and would not affect habitat to any degree. The addition of grouse drumming logs would improve habitat conditions in the future.

Road decommissioning would return a small portion of suitable habitat to more suitable conditions. Waterhole construction may provide a small amount of habitat in drier areas. Nest box installation, tree planting, and road authorization would not cause any impacts.

Although snail habitat would be altered in the Paint Creek watershed, the amount available across the analysis area would remain sufficient to support habitat requirements. Because the activities would occur over an extended period of time (years), and are scattered across the watershed, the alternatives (Table 3tt) may have localized negative impacts, but would not cause long-term effects to the population trends in the analysis area.

Table 3tt: Acres of Terrestrial Snail Habitat Impacted by Activity and Alternative

Activity	Alternative		
	B	C	D
ESF	349	190	349
Thinning	122	170	122
Midstory	95	62	491
Pre-harvest treatments	471	360	284
Road construction	1	2	2

Cumulative Effects of Alternative B

Carolina Mountain dusky salamander*:* Combined with past and future burning activities, the alternatives would have a negative cumulative effect. Burning combined with the proposed ESH and road construction would decrease suitable habitat in the analysis area due to the loss of large woody debris (cover), shading, increased sunlight, and elevated temperatures on the forest floor. Habitat would remain widely available in adjacent stands and across the analysis area and populations would persist, so these negative cumulative effects would not contribute to the decline of these species or their habitats across the CNF.

Diana fritillary*:* Cumulative effects of past and future burning, combined with the alternatives would be negative to caterpillars but beneficial to adults. The project would have a positive cumulative effect on *Diana fritillary* by creating more open habitat and improving habitat diversity. Diana fritillary is abundant in areas where prescribed burning has been taking place on a three to five year rotation since 1995 and where multiple timber harvests have occurred. These effects would not contribute to the decline of this species or its habitat across the CNF.

Broad, wrinkled, and ***flat button****; lamellate, glossy,* and ***white-footed supercoil****; highland slitmouth; bidentate, crossed, hollow,* and ***rounded dome****:* Combined with past thinning and past and future burning, the alternatives would have a negative cumulative effect on these snails. Burning combined with the proposed harvest activities would decrease suitable habitat in the analysis area due to the loss of large woody debris (cover), shading, increased sunlight, and elevated temperatures on the forest floor. Habitat would remain widely available in adjacent stands and across the analysis area and populations would persist, so these negative cumulative effects would not contribute to the decline of these species or their habitats across the CNF.

Gray bat*:* Past prescribed burning may have had slightly beneficial effects, and timber harvesting would have had little to no effects. Burning is also planned for the future, resulting in the same type of impacts. Cumulative effects of these past and future activities, combined with the alternative would be slightly beneficial. These cumulative effects would not contribute to the decline of this species or its habitat across the CNF.

Indiana bat, Eastern small-footed bat, and ***Rafinesque's big-eared bat****:* The alternatives, combined with past and future burning, would have a positive cumulative effect. Snags would have been lost and created during past prescribed burning and would be retained or created in future thinning. The cumulative effect would be a more open and diverse forest with abundant

snags and better foraging opportunities.

Swainson's warbler: The alternatives would have a slight adverse cumulative effect on habitat within the analysis area. Past thinning and past and future burning would have the same effects as discussed previously. Suitable habitat would continue to be abundant and widespread. Populations are likely to continue on a positive trend and the alternative would not threaten the viability of Swainson's warbler across the CNF.

Whip-poor-will*:* The alternatives would have a positive cumulative effect on habitat by increasing the amount of habitat in the analysis area. Past burning and thinning have created habitat in the last 10 years. Small patches of ESF habitat may be created by future prescribed burning and natural disturbances. By providing a shifting mosaic of low elevation ESF, the alternatives would help lessen the negative population trend of prairie warbler in the analysis area and ensure the species' viability across the CNF.

Common raven: The alternatives would have a positive cumulative effect. Past and future prescribed burning and past thinning would also improve habitat conditions for ravens. Burning would improve conditions for foraging and would increase sunlight, plant, and insect production. These combined activities would increase habitat diversity and food sources in the analysis area. The alternatives would ensure the viability of this species across the CNF.

Cumulative Effects of Alternative C/D

The types of cumulative effects to rare animal species under this alternative would be the same as Alternative B. Only the size and magnitude of the effects would differ.

Plants

Alternative A (No Action)

Direct and Indirect Effects

Piratebush, marsh marigold, rough sedge, golden saxifrage, Steele's Joe-pye-weed, maple-leaf alumroot, kidney-leaf twayblade, golden club, swamp lousewort, ashleaf goldenbanner, painted trillium, and *Eastern turkey beard* have been documented in close proximity to roads, trails, power lines, and/or wildlife openings within the Paint Creek Analysis Area. Current management activities would continue under this alternative. Individuals along roads, trails, power line, and wildlife openings would continue to be periodically disturbed by use and maintenance activities. Trampling, disturbance, and loss of individuals would occur as a result of these activities. Competition from native and invasive species would also contribute to population fluctuations over time; however, extirpation of these species from the area would not be expected. These disturbances help create and maintain suitable habitat conditions allowing plants to occupy these locations. Maintenance and use activities have been ongoing for many years and species have adapted to this level of disturbance at these sites.

Marsh bellflower, broadleaf sedge, large whorled pogonia, and *small purple-fringed orchid* have not been documented in close proximity to roads, trails, power lines and wildlife openings within

the Paint Creek Analysis Area. Therefore, these species would not be impacted by these ongoing management activities. However, some species may experience local population fluctuations due to changing habitat conditions due to succession, insect/disease outbreaks, or other natural disturbances over the next five year period. Individuals currently taking advantage of canopy gaps, limited competition, or previous silvicultural activities may experience some declines as forest succession decreases light, or increases competition within currently occupied habitat. Ongoing management activities and natural disturbances (storm damage, canopy gap creation) would continue to create opportunities for establishment.

For rare species that routinely utilize early successional habitat, suitable habitat would remain limited as no early successional forest habitat is created through management. This habitat is currently restricted to existing road corridors, wildlife openings, power line right-of ways, forest edges and naturally occurring gaps from storms, wildfires, insects and disease, and tree mortality. Selection of Alternative A would continue to restrict this habitat within the Paint Creek project area, which may result in occurrences being lost due to shading or competition within the analysis area. Species would continue to occur at lower frequencies until additional habitat is created through natural processes. This may occur over the next five years as mortality from Hemlock wooly adelgid continues to increase.

For species that generally prefer older stands, habitat availability would increase as stands continue to mature. Populations would fluctuate in response to changing conditions resulting from natural processes (succession, canopy gap creation, etc.). Ongoing management activities and natural disturbances (storm damage, canopy gap creation) would continue to create opportunities for establishment and maintain suitable habitat within the analysis area for all rare species present. Late successional species would continue to flourish, while early successional species would occur at lower frequencies unless additional early successional habitat is created through natural processes.

Cumulative Effects

There are no cumulative effects on *piratebush, marsh marigold, marsh bellflower, broadleaf sedge, rough sedge, golden saxifrage, Steele's Joe-pye-weed, maple-leaf alumroot, large whorled pogonia, kidney-leaf twayblade, golden club, swamp lousewort, small purple-fringed orchid, ashleaf goldenbanner, painted trillium, and eastern turkey beard* associated with Alternative A because no new actions would be implemented under this alternative. Future habitat conditions within the Paint Creek Analysis Area would be the result of natural processes, ongoing activities, and past and future projects.

Alternative B (Proposed Action)

Direct and Indirect Impacts

Herbicide use is proposed for shelterwood harvest, thinning, and midstory treatments under Alternative B. Approximately 624 acres would be treated using herbicides, but only a portion of the acres treated would be directly impacted. The herbicides proposed for these treatments are unlikely to contact rare plant species directly because:

- Specific methods would be used for application (thinline or stump treatments).
- Criteria for herbicide use are designed to minimize movement to non-target individuals.
- Leave areas have been establish at many rare plant locations.

However, accidental contact (nozzle drip, leak or spill) could occur in rare circumstances that would result in individual losses at some sites. Trampling as a result of herbicide treatment could also result in injury or losses to some individuals in close proximity to target individuals.

Impacts from nest boxes, vernal ponds, and drumming logs are expected to be negligible because impact areas are small and no rare species are present where ground disturbing activities would occur. Most of these wildlife improvements occur in areas recently disturbed by road or silvicultural activities leaving little opportunity for rare species establishment.

Authorization of 8.3 miles of roads would have no direct effects on rare plant species. These roads are already present on the ground and in use. Habitat conditions are not expected to change as a result of this decision. Decommissioning of 3.7 miles of roads would result in opportunities for establishment for some rare species. Construction of 0.3 miles of temporary would have no direct effects on rare plant species as no rare plants were documented along this existing wildlife opening (McGuiness 2013).

No direct or indirect impacts would occur to ***marsh bellflower*** under Alternative B. Known occurrences of these plants either occur outside of treatment areas, or have been excluded from direct impacts through riparian buffers. Populations would not be impacted by implementation of Alternative B.

No direct impacts would occur to ***large whorled pogonia*** under Alternative B. Known occurrences of this plant have been excluded from direct impacts through exclusions or being located outside of treatment areas. Indirect impacts that would occur as a result of treatment in adjacent areas include: minor changes in microsite conditions (light, moisture), plant competition, and opportunities to expand or colonize additional areas that have become favorable habitat as a result of treatment. Some population fluctuations would occur, but these species would remain within the analysis area.

Forest Sensitive Species – Three documented Sensitive plant species, *piratebush, maple-leaf alumroot and ashleaf goldenbanner,* could incur impacts under this alternative.

Piratebush has been documented in close proximity to two sites within the analysis area that have been proposed for crop tree release under Alternative B. This plant is also known from three other sites within the analysis area which are not impacted under this alternative. If individuals are present within these sites, then crop tree release (chainsaw slashdown) would result in some impacts including limb breaking, trampling, covering by cut stems, and accidental treatment. Individuals located within riparian areas or outside the stand boundary would be protected from direct impacts. Treatment would result in the removal of competing vegetation providing favorable habitat conditions for recovery (sprouting and growth) and establishment

following the project. Populations may increase after treatment for 2-5 years and then slowly decline towards previous levels as canopy cover is established. Plants would remain within the future stand where suitable habitat is present.

Some populations are in close proximity to roads, trails and power lines. Maintenance would result in damage and potentially loss of a few individuals located in very close proximity to the road. Trail maintenance results in the trimming back of branches growing into the trail. Maintenance activities have been ongoing for many years and this species has adapted to this level of disturbance, and plants take advantage of the habitat conditions provided at these sites. Populations would initially decline, but then take advantage of the suitable habitat conditions to recover and potentially expand at these sites. This results in population fluctuations, but piratebush is expected to remain at these sites.

Maple-leaf alumroot was documented from five sites within the analysis area that have been proposed for shelterwood harvest, thinning and prescribed burning under Alternative B. Some populations are in close proximity to roads and may be impacted by road maintenance activities. This plant is also known from eight other sites within the analysis area which are not impacted under this alternative.

Impacts of road maintenance would be similar to those described for piratebush. Shelterwood harvest and thinning would result in the loss of some individuals. Individuals located within leave clumps, exclusions, or outside the stand boundary would be protected from direct impacts.

Habitat conditions would be favorable for recovery, establishment, and expansion within thinning areas and leave clumps following the project. Populations would be expected to increase after treatment for 2-5 years and then slowly decline as canopy cover is established. Habitat conditions would be less favorable for plants located within shelterwood areas. Light conditions and increased plant competition would result in higher mortality rates and slower recovery within these areas. Plant populations would fluctuate in response to available habitat conditions. Plants would remain within the future stand where suitable habitat is present.

Individuals are known to occur within the Devil's Kitchen and Ricker Mountain prescribed burns. Some individuals may be lost or damaged during the construction of fire lines. Direct impacts from burning are not expected as plants would be dormant at the time of the burn. Prescribed burning would improve habitat conditions for maple-leaf alumroot by reducing midstory vegetation and maintaining/creating filtered to partial light conditions within the area. Plants would respond favorably to these conditions allowing population expansion to occur over the next two to five years.

Ashleaf goldenbanner was documented from two sites within the analysis area. One of these sites is located within the Upper Paint Creek prescribed burn proposed in Alternative B. Both sites are located adjacent to roads and would be impacted by road maintenance activities prior to the burn. Impacts of road maintenance would be similar to those described for piratebush. Direct impacts from burning are not expected as plants would be dormant at the time of the burn. Prescribed burning would improve habitat conditions for ash-leaf goldenbanner by reducing

midstory vegetation that is partially shading this population. Gaps created in the thick mountain laurel cover adjacent to this site may provide opportunities for population expansion over the next two to five years following the burn.

Other planned activities under Alternative B would not have direct impacts on piratebush, maple-leaf alumroot or ashleaf goldenbanner because they are not known to occur within these areas. These plants occur in a variety of habitat including road sides, forest and trail edges, rock outcropping, open forests, and canopy gaps. Harvest, crop tree release, midstory treatments, road maintenance, road decommissioning, prescribed burning, and invasive species control would provide improved habitat conditions and opportunities for establishment within the analysis area. Some actions (shelterwood harvest, road construction) would have some initial negative impacts, but create suitable habitat conditions following implementation. Populations would fluctuate as a result of activities and habitat conditions, but individuals would remain within the analysis area.

Forest Viability Species – Twelve viability plant species have been documented within the analysis area that could incur impacts under this alternative. Impacts on *marsh bellflower* and *large whorled pogonia* have been previously discussed under Alternative B.

Marsh marigold was documented within the Allen Gap pond restoration area and is known from two other sites within the analysis area. Restoration activities at the Allen Gap site are intended to create improved habitat conditions for this wetland plant. Shading and competition from other plants is limiting available habitat for Marsh Marigold. Trees that are shading the pond and outflow channel would be thinned, and midstory vegetation (primarily rhododendron) that is overgrowing the edges would be treated in order to expand available habitat. Encroaching herbaceous vegetation would be removed by hand-pulling or treatment with aquatic approved herbicide. Given the proximity of the work to the population, some individuals would be lost (trampling, accidental removal, etc.) during implementation. Populations are expected to recover and expand into previously occupied habitat following treatment.

Broadleaf sedge was documented at one site within the Devil's Kitchen Branch prescribed burn. Direct impacts from burning are not expected as plants would be dormant at the time of the burn. Given the mesic conditions present, burn intensity at the site is expected to be low. Prescribed burning may improve habitat conditions by reducing midstory vegetation. Plants would respond favorably if midstory vegetation is reduced allowing population expansion to occur over the next two to five years. The population would remain in the area following the burn.

Rough sedge was documented in eight areas proposed for shelterwood harvest, thinning, and prescribed burning under this alternative. This is a plant that occurs in seeps, springs, and slow moving streams. Most occurrences would be protected from direct and indirect impacts by riparian buffers. No impacts are expected from prescribed burning. At least one occurrence is associated with the road corridor and would be impacted by pre-haul maintenance. Individual losses would occur at the site, but suitable habitat conditions would remain. The population would recover from the disturbance and expand into suitable habitat that was previously shaded out by midstory competition. This habitat should remain available to this plant for 2-5 years, and then slowly decline as midstory cover is reestablished. Plants would remain within the future

stand where suitable habitat is present.

Golden saxifrage was documented in three areas proposed for shelterwood harvest, thinning, and the Allen Gap pond restoration project. This plant is also known from one other site within the analysis area that would not be impacted under this alternative. Impacts of restoration work at Allen Gap pond would be the same as those described for Marsh Marigold. Golden saxifrage is a plant that occurs in saturated soils. Plants would be protected by a riparian buffer within areas proposed for shelterwood and thinning. Therefore, direct and indirect impacts are not expected from these activities.

Steele's Joe-pye weed was documented in five areas proposed for shelterwood harvest, fire line construction, and within the Ricker Mountain and Devil's Kitchen Branch prescribed burns. Plants are also associated with the road corridor and would be impacted by road maintenance activities. This plant occurs in a variety of habitats including road sides, forest and trail edges, mesic forest, and canopy gaps.

Shelterwood harvest would result in the loss of some individuals. Individuals located within riparian areas, leave clumps or outside the stand boundary would be protected from direct impacts. Habitat conditions would be favorable for establishment within treatment areas following the project. Populations would be expected to increase after treatment for 2-5 years and then slowly decline toward previous levels as canopy cover is established. Plants would remain within the future stand where suitable habitat is present.

Fire line construction would also result in the loss of some individuals. Habitat conditions following construction would be suitable for recovery and expansion within fire lines and associated edges. Direct impacts are not expected from prescribed burning as plants would be dormant at the time of the burn. Prescribed burning would improve habitat conditions by reducing midstory vegetation and maintain/creating partial or filtered light conditions. Populations would be expected to increase after treatment for 2-5 years and then slowly decline to previous levels as canopy cover is established. Impacts of pre-haul maintenance activities would be similar to those described for fire line construction.

Plants are known to occur along the edge of one road that would be authorized under Alternative B. This road is currently in use and authorization of the road would not lead to any changes in habitat conditions on the ground. Maintenance and use of this road results in some impacts (trampling, dislodging), but it also retains suitable habitat conditions at the site. Populations would remain, and fluctuate in response to habitat conditions, and time from last disturbance.

Other planned activities under Alternative B would not have direct impacts on Steele's joe-pye-weed because it is not known to occur within these areas. Crop tree release, midstory treatments, invasive species control, wildlife opening maintenance, and decommissioning system roads would provide improved habitat conditions and opportunities for establishment within the analysis area. Shelterwood harvest, thinning, restoration work, and road construction would have some initial negative impacts, but create suitable habitat conditions following implementation. Populations would fluctuate as a result of activities and habitat conditions, but individuals would remain within the analysis area.

Kidney-leaf twayblade was documented in six areas proposed for shelterwood harvest, thinning, crop tree release and prescribed burning under Alternative B. Populations associated with the road corridor would be impacted by road maintenance activities. This plant is also known from one other site in the analysis area that would not be impacted by proposed activities.

Most populations would be protected from direct impacts by riparian buffers. Indirect effects (changes in light and moisture conditions) may occur at these sites due to activities in adjacent areas. This may result in minor population fluctuations. Plants occurring outside riparian buffers would incur direct impacts resulting in injury and losses to some individuals. Habitat conditions within shelterwood and thinning areas would be marginal for this species for 3-5 years following treatment, but then gradually improve as the stand matures. Pre- and post-treatments on rhododendron would alter habitat in the stand. This could have positive (new habitat to expand into) or negative impacts (site becomes too dry) depending on moisture conditions and plant competition following treatment. Future populations in the stand would be determined by impacts during treatment, response to plant competition and changes in microsite conditions (light, moisture) following implementation.

Crop tree release (chainsaw slashdown) would result in negative impacts to kidney-leaf twayblade. Treatment of rhododendron and competing species would bury some individuals under debris and decrease moisture conditions at the site until remaining vegetation responds to treatment. This same area is located within the Upper Paint Creek prescribed burn. Direct impacts are not expected from prescribed burning as plants would be dormant at the time of the burn. If burning occurs post-treatment, then the added debris would increase the intensity and probability of fire carrying through this area. This would result in additional rhododendron mortality causing a reduction in habitat suitability. If burning occurs prior to treatment, then fire intensity would be much lower (higher moisture conditions, lower fuel availability), reducing impacts to this species. Populations would fluctuate as a result of activities and habitat conditions, but individuals would remain in the area. Populations would recover as rhododendron recovers from treatment over time.

At least one population would be impacted by road maintenance activities. Individual losses would occur at this site, but suitable habitat conditions would remain. Populations would fluctuate in response to available habitat conditions. Recovery would occur as vegetation responds to treatment.

Golden club was documented at three sites within the analysis area. One population would be impacted by road maintenance activities. Most of this population is located outside of the road corridor and would not be impacted by activities. However, some individuals immediately adjacent to the road corridor could be damaged or lost when maintenance occurs. Habitat would remain at the site and plants would be expected to recolonize the site following maintenance activities. The second population is located within the Devil's Kitchen Branch prescribed burn. This is a wetland species, so no direct impacts are expected. Plants may respond favorably to prescribed fire if the burn reduces vegetation on upland sites that are overgrowing suitable wetland habitat. Plants located at the Rough Branch Beaver Pond would not be impacted under this alternative.

Swamp lousewort occurs at Cutshall Bog and Devil's Kitchen Branch Bog. However, swamp lousewort has not been seen at the Cutshall Bog site in recent years since areas where it occurred have become overgrown by competing vegetation. Impacts associated with prescribed burning and road maintenance activities would be the same as those described for golden club. Maintenance activities may provide an opening for this species to be rediscovered within this community.

Small purple-fringed orchid was documented at one site within the Upper Paint Creek prescribed burn and two other sites that would not be impacted under this alternative. No direct impacts are expected at this site as moisture conditions are too high to carry a fire through this area. Some habitat improvements may occur if fire is capable of reducing the midstory layer in surrounding areas. This would provide opportunities for population expansion if these conditions are created.

Painted trillium was documented in three areas proposed for shelterwood harvest and thinning under Alternative B. Individuals would be lost (crushed, trampled, covered by logging debris) during implementation. Areas with lower basal area (>30) would be less suitable for this plant than areas where more trees remain. Populations would fluctuate as a result of plant competition and habitat conditions following treatment and initial population declines should be expected. Individuals would remain within exclusions, leave clumps, and scattered locations within the stand. Conditions would improve as a new forest canopy is established (7-10 years) allowing recovery to occur in the area. Recovery would occur where microsite conditions (light, moisture, and plant competition) are favorable. Future populations in these stands would be determined by existing conditions, plant competition and recruitment.

Other planned activities under Alternative B would not have direct impacts on painted trillium because it is not known to occur within these areas. This plant prefers mesic forest conditions. Invasive species control, midstory treatments, and road decommissioning would provide improved habitat conditions within the analysis area by reducing competing vegetation. Shelterwood harvest, crop tree release, and road construction would have negative impacts on habitat availability until canopy cover is reestablished within these areas. Populations would fluctuate as a result of activities and habitat conditions, but individuals would remain within the analysis area.

Eastern turkey beard was documented from four sites within the analysis area. Three of these sites are located within the Upper Paint Creek prescribed burn proposed in Alternative B. Two sites are located adjacent to roads and would be impacted by road maintenance activities prior to the burn. Maintenance would result in damage and potentially loss of a few individuals located in very close proximity to the road. Maintenance activities have been ongoing for many years and this species has adapted to this level of disturbance, and plants takes advantage of the habitat conditions provided at these sites. Populations would initially decline, but then take advantage of the suitable habitat conditions to recover and potentially expand at these sites. Activities result in population fluctuations, but eastern turkey beard is expected to remain at these sites.

Direct impacts from burning are not expected as plants would be dormant at the time of the burn. Prescribed burning would improve habitat conditions for eastern turkey beard by reducing

midstory vegetation that is shading these populations. Gaps created in the thick mountain laurel cover adjacent to this site may provide opportunities for population expansion over the next two to five years following the burn.

Cumulative Effects of Alternative B

Prescribed burning in the last five years, combined with future burning, ongoing maintenance, hemlock treatments, trail construction, past and future floods, wildfires, and implementation of activities under Alternative B would increase habitat diversity within the analysis area. Actions result in population fluctuations, but create and maintain suitable habitat conditions that can be occupied by a wide variety of plant species. This alternative reestablishes an early successional forest component on 377 acres of the landscape that has declined in recent years though succession into sapling/pole forest. Actions would reduce and modify mid- and late successional forest and improve suitability for species that prefer early forest conditions. Thinning 152 acres would provide open forest habitat and restoration work at Allen Gap pond would improve habitat conditions for wetland species. Implementation would result in a mosaic distribution of habitats within the landscape. The cumulative impact of past and future actions would create a variety of early, mid, and late successional forest conditions on the landscape providing suitable habitat for a wide range of rare species in the area.

Cumulative impacts associated with maintenance activities (trail, road, wildlife, etc.) have been incorporated in the direct and indirect effects analysis due to the ongoing nature of these projects. Therefore, only cumulative effects associated with hemlock treatments, flood and fire events and prescribed burning will be discussed in this section (Table 3kk).

Known populations of *marsh bellflower* would not be directly or indirectly impacted under Alternative B. Therefore, no cumulative impacts are expected.

Recent minor flood events in the Paint Creek watershed have resulting in scouring and movement of sediment resulting in incised ditches, side channels, pools, and forested wetland flats along streams and side drainages. *Marsh marigold, rough sedge,* and *golden saxifrage* occupy these types of habitats and have undergone population fluctuations as a result of changing habitat conditions and availability within the watershed. These events combined with activities proposed under Alternative B have resulted in cumulative effects that impact the distribution of these plants on the landscape.

Impacts from flooding at locations where *swamp lousewort* and *golden club* occur have been negligible (short-term water rises). These populations do not occur in areas where other cumulative actions occur (see Table 3kk). Therefore, cumulative impacts are expected to be negligible.

Hemlock treatments are retaining the presence of eastern hemlock within the Paint Creek watershed. Although not currently occupying this habitat, this activity does provide suitable habitat for *piratebush* and *kidney-leaf twayblade* within these treatment areas. This action would reduce the impacts on cove habitats as hemlock mortality increases throughout the area.

This alternative, combined with past and future burning (both prescribed and wildfires) would have a positive cumulative effect on *Steele's Joe-pye-weed*, *maple-leaf alumroot, ashleaf goldenbanner,* and *Eastern turkey beard*. All of these species are known to occur within the burn areas. Dormant season burns are not expected to directly impact individuals, but some direct impacts would occur as a result of summer wildfires. Burning would reduce woody competition within these areas. This would improve habitat conditions by reducing plant competition from woody plants in the understory and midstory. Increase light resulting from reduced plant competition would improve flowering rates where suitable habitat is present. Establishment could occur in areas where herbaceous plant competition is low to moderate. Future burning of this area would maintain suitable habitat conditions for these species within this project area.

Piratebush would benefit from a low intensity prescribed fire by taking advantage of light gaps and reduced competition. This shrub would incur some direct impacts, but sprouting would allow individuals to take advantage of beneficial habitat conditions. A moderate to high intensity burn could result in negative impacts as direct impacts combined with changes in light and moisture conditions may reduce habitat quality. Plants would resprout and future populations would be determined by available habitat conditions.

Recent minor flood events have had little impact on current populations. Any future flood events along the French Broad River would impact individuals occurring at these sites. Depending on the intensity of the flood, damage and some mortality would occur. These events maintain an open midstory, providing suitable habitat conditions for piratebush. Populations would fluctuate, but plants would remain in the area.

Cumulative impacts are expected for *broadleaf sedge, large whorled pogonia, small purple fringed orchid,* and *painted trillium*. Some impacts are expected to these species under Alternative B. Past and future dormant season burns would not result in direct impacts to individuals, but it would modify habitat conditions for these species in the analysis area. Prescribed burning would alter light and moisture conditions and create more open forest conditions by reducing woody competition in the midstory and understory layer. Population expansion would be expected in areas where light and moisture conditions remain suitable, but some declines may occur where conditions become too dry. Populations of these species would fluctuate in response to available habitat conditions.

Many of the *kidney-leaf twayblade* occurrences within the analysis area are located within very moist environments that would not burn (no cumulative impacts). There are a few occurrences within treatment areas that are capable of being burned. The combination of silvicultural treatment and burning is likely to have a negative cumulative effect at these sites. Activities would increase light and decrease moisture availability resulting in less favorable habitat conditions. Populations would decline at these locations until more favorable conditions (increased moisture as light gaps close and midstory increases) return.

Management actions proposed under Alternative B, and past and future actions occurring on Forest Service lands are consistent with the RLRMP, and would ensure that suitable habitat remains for rare species within the Cherokee National Forest.

Alternative C

Direct and Indirect Impacts

Activities would not put the viability of any rare species at risk on the CNF.

The effects to rare species would be the same as for Alternative B. Only the size and magnitude of the effects for the same activities would differ, so only the changes will be discussed.

Alternative C proposes similar management activities to Alternative B, but adds 1.0 mile of road construction, 1.0 miles of road decommissioning, and restoration work at Cutshall Bog, a designated rare community on the Cherokee National Forest. The total acreage of early successional forest habitat created (302 acres), crop tree release (49 acres), and midstory treatments (84 acres) are reduced, but the amount of thinning (203 acres) is increased in this alternative. Implementation requires 17.1 miles of pre-haul maintenance and would decommission 4.7 miles of road. All other actions are same as Alternative B.

Alternative C increases management activities within Compartments 209 and 264. Activities in this area include: construction and decommissioning of 1.0 mile to reroute FS road 93, 89 acres of shelterwood harvest, 37 acres of thinning, 22 acres of midstory treatment, and restoration work in Cutshall Bog to improve habitat conditions for wetland species. Alternative C drops 47 acres of crop tree release proposed in these compartments under Alternative B.

Direct and indirect impacts for *piratebush, broadleaf sedge, golden saxifrage, small purple fringed orchid, ashleaf goldenbanner* and *eastern turkey beard* would be the same as Alternative B. Despite differences in these alternatives, no additional known populations are impacted under this alternative. No direct, indirect, or cumulative effects would occur to *large whorled pogonia* under Alternative C, because no actions are proposed at known sites.

Forest Sensitive Species – Three Sensitive plant species, *piratebush, maple-leaf alumroot* and *ashleaf goldenbanner* have been documented that would incur impacts under this alternative. Impacts on *piratebush* and *ashleaf goldenbanner* would be the same as Alternative B. Impacts to *maple-leaf alumroot* would be similar to those described in Alternative B, but fewer occurrences are directly impacted by this alternative.

Forest Viability Species – Twelve viability plant species have been documented within the analysis area that would incur impacts under this alternative. Direct and indirect impacts for *broadleaf sedge, golden saxifrage* and *small purple-fringed orchid* would be the same as Alternative B. Despite differences in these alternatives, no additional known populations are impacted under this alternative. No direct, indirect, or cumulative effects would occur to *large whorled pogonia* under Alternative C, because no actions are proposed at known sites. Available habitat conditions would change as a result of implementation, but suitable habitat and populations would remain within the analysis area.

Marsh marigold, marsh bellflower, golden club, and *swamp lousewort* would all incur impacts as a result of decommissioning FS road 93 and restoration activities in the Cutshall Bog rare community. FS road 93 bisects this rare community resulting in abnormal water flows, illegal vehicle use, and sediment deposition within the bog during intense rain events. Alternative C

would reroute the road around the bog and remove the decommissioned section across the bog in order to restore normal water flow throughout this wetland area. Other restoration improvements include controlling encroaching vegetation around the bog edges and control of invasive species at the site. Actions within Cutshall Bog would alter the current water levels and habitat conditions for these species. Losses would occur as a result of treatment. Existing populations have adapted to the present conditions and populations fluctuations would occur as a result of treatment. All species would benefit from control of encroaching vegetation and invasive species. Populations of golden club would be expected to decrease as water levels in the upper portion of the bog drop. Populations of marsh marigold, marsh bellflower and swamp lousewort may increase as water is more evenly distributed throughout the bog providing better habitat conditions for these species. Impacts to other populations of marsh marigold, golden club, and swamp lousewort would remain the same as Alternative B.

Impacts to *Steele's Joe-pye-weed* would be similar to those described under Alternative B. However, some individuals located within the Devil's Kitchen Branch prescribed burn would also be subject to shelterwood harvest or thinning under this alternative. Individual losses would occur as a result of treatment. Suitable habitat conditions would remain within these areas allowing populations to recover and expand into areas where conditions are favorable. Population increases would be expected for two to five years following treatment and then slowly decline as canopy cover increases. Areas maintained in an open forest condition would provide favorable habitat for many years.
Impacts to *rough sedge, maple-leaf alumroot, kidney-leaf twayblade,* and *painted trillium* would be similar to those described in Alternative B, but fewer occurrences are directly impacted by this alternative.

Cumulative Effects

Cumulative effects to *Piratebush, marsh marigold, broadleaf sedge, rough sedge, golden saxifrage, Steele's Joe-pye-weed, maple-leaf alumroot, kidney-leaf twayblade, golden club, swamp lousewort, small purple-fringed orchid, ashleaf goldenbanner, painted trillium* and *eastern turkey beard* would be very similar to those described under Alternative B.

No cumulative impacts are expected for *large whorled pogonia* because known populations are not treated under this alternative. Cumulative impacts for *marsh bellflower* would be the same as those described for swamp lousewort under Alternative B (negligible impacts from short term water rises as a result of flood events).

Alternative C and other activities in the analysis area would create a mosaic of habitats capable of supporting many rare species. Alternative C proposes similar management activities to Alternative B, but adds 1.0 mile of road construction, 1.0 miles of road decommissioning, and restoration work at Cutshall Bog, a designated rare community on the Cherokee National Forest. The total acreage of early successional forest habitat created (302 acres), crop tree release (49 acres), and midstory treatments (84 acres) are reduced, but the amount of thinning (203 acres) is increased in this alternative. None of the additional treatments proposed under Alternative C overlap with other prescribed burn considered under cumulative effects (see Table 3kk). Management actions proposed under Alternative C, and past and future actions occurring on Forest Service lands are consistent with the RLRMP, and would ensure that suitable habitat

remains for rare species within the Cherokee National Forest.

Alternative D

Direct and Indirect Impacts

The effects to rare plant species would be the same as for those described under Alternatives B and restoration work at Cutshall Bog in Alternative C. Only the size and magnitude of the effects for the same activities would differ, so only the changes will be discussed.

Alternative D proposes additional management activities resulting in the most ground disturbance of the four alternatives. Many of the areas treated under Alternative D are also treated under Alternatives B or C. This alternative increases the total acreage of early successional forest habitat created (398 acres), and number of midstory treatments (513 acres) implemented. Alternative D adds 103 acres of group selection harvest and includes restoration work at two rare communities (Cutshall Bog and Devil's Kitchen Branch Bog) and two other wetland sites (Allen Gap Pond and Rough Branch Beaver Pond). Crop tree release, thinning, and other wildlife habitat improvements are the same as Alternative B. Implementation requires 16.2 miles of pre-haul maintenance. Construction, reconstruction, decommissioning, and authorization of roads would be the same as Alternative C.

The types of effects to rare species associated with group selection harvest would be similar to those described for shelterwood harvest and thinning. The types of effects to rare species associated with restoration work at Devil's Kitchen Branch Bog and the Rough Branch Beaver pond were previously discussed under restoration work for Allen Gap Pond and Cutshall Bog.

Forest Sensitive Species – Three Sensitive plant species, *piratebush, maple-leaf alumroot* and *ashleaf goldenbanner* have been documented that would incur impacts under this alternative. Impacts on *piratebush and ashleaf goldenbanner* are the same as Alternative B. Impacts to *maple-leaf alumroot* are similar to those described in Alternative B, but one additional occurrence is impacted by a midstory treatment. Midstory treatment may result in some individual losses due to accidental treatment with herbicide. Treatment would reduce competition and increase light conditions creating favorable conditions for recovery and expansion. Population increases would be expected for 2-5 years following treatment.

Forest Viability Species – Twelve viability plant species have been documented within the analysis area that would incur impacts under this alternative. Direct and indirect impacts for *rough sedge, large whorled pogonia, kidney-leaf twayblade, small purple-fringed orchid, painted trillium,* and *Eastern turkey beard* would be the same as Alternative B. Direct and indirect impacts for *marsh marigold* and *marsh bellflower* would be the same as Alternative C. Despite differences in these alternatives, no additional known populations are impacted under this alternative. Available habitat conditions would change as a result of implementation, but suitable habitat and populations would remain within the analysis area.

Impacts to *golden saxifrage, golden club* and *swamp lousewort* would be similar to those described under Alternative C, but additional improvements to habitat would be made through restoration work at other wetland sites. Plants present in the Devil's Kitchen Branch Bog or

Rough Branch Beaver Pond would benefit from control of encroaching vegetation and invasive species. This would allow an opportunity for population expansion following treatment.

Broadleaf sedge is located within an area that is proposed for group selection harvest under Alternative D. Known occurrences of this plant have been excluded from direct impacts through exclusions or being located outside of treatment area. Indirect impacts that would occur as a result of treatment in adjacent areas include: minor changes in microsite conditions (light, moisture), plant competition, and opportunities to expand or colonize additional areas that have become favorable habitat as a result of treatment. Impacts of prescribed burning would be the same as described in Alternative B. Some population fluctuations would occur, but these species would remain within the analysis area.

Impacts to *Steele's Joe-pye-weed* would be similar to those described under Alternatives B and C. However, some individuals located within the Devil's Kitchen Branch prescribed burn would also be subject to shelterwood harvest, group selection or midstory treatments under this alternative. Individual losses would occur as a result of treatment. Suitable habitat conditions would remain within these areas allowing populations to recover and expand into areas where conditions are favorable. Population increases would be expected for two to five years following treatment and then slowly decline towards previous levels as canopy cover increases. Areas maintained in an open forest condition would provide favorable habitat for many years.

Cumulative Effects

Cumulative effects to *piratebush, broadleaf sedge, rough sedge, Steele's Joe-pye-weed, maple-leaf alumroot, large whorled pogonia, kidney-leaf twayblade, small purple-fringed orchid, ashleaf goldenbanner, painted trillium* and *Eastern turkey beard* would be very similar to those described under Alternative B. Cumulative effects to *marsh marigold, marsh bellflower, golden saxifrage, golden club* and *swamp lousewort* would be very similar to those described under Alternative C.

Alternative D and other activities in the analysis area would create a mosaic of habitats capable of supporting many rare species. Alternative D proposes similar management activities to Alternative B and C, but adds group selection harvest and restoration of two additional wetland communities. Management actions proposed under Alternative D, and past and future actions occurring on Forest Service lands are consistent with the RLRMP, and would ensure that suitable habitat remains for rare species within the Cherokee National Forest.

Rare Communities

Affected Environment

Two rare communities designated in the Forest Plan (USDA Forest Service 2004a, p. 340-343) occur with the Paint Creek Analysis Area. A brief description of each is given below.

Cutshall Bog is a complex of small, open circumneutral fens surrounded by a forest wetland. It is located in the headwaters of an unnamed tributary of Paint Creek within Compartment 264. The rare community is 23 acres in size, which includes the bog, upstream side tributaries, and lower

slopes adjacent to the bog. Forest Service Road 93 bisects the bog into an upper and lower section. Four viability species—Marsh marigold, Marsh bellflower, Golden club and Swamp lousewort—have been documented in the area (McGuiness 2013). Marsh marigold was transplanted into the bog in 2000. Swamp lousewort has not been observed at the site in the past few years. Populations of this plant have always been low, and individuals may currently be suppressed by competing vegetation.

Past road improvements on FS 93 have resulted in changes to hydrology over time. Water flow across the road has slowed resulting in increased water levels in the upper section, while levels in the lower section have decreased. Sediment deposition is occurring along the western side of the bog due to erosion and vehicle use on a steep section of FS 93 immediately adjacent to the site.

Pine forests adjacent to the bog were thinned in 1998. Illegal vehicle use in the bog used to be an issue, but has subsided in recent years. Exotic species, especially Nepal grass (*Microstegium vimineum*) and Japanese Honeysuckle (*Lonicera japonica*) are prevalent in the area. Encroachment of woody vegetation within the lower section of the bog and bog edges is increasing competition and lowering suitability for wetland species at the site.

Devil's Kitchen Branch Bog is a forested streamside wetland/bog located in the headwaters of Devils Kitchen Branch within Compartment 209. The rare community is 82 acres in size and consists of the bog, upstream side tributaries, and forested slopes adjacent to the bog. Forest Road FS 93 is located along or near the boundary of this rare community. Two viability species, Golden Club and Swamp Lousewort have been documented at the site.

Portions of the area were a homestead before being acquired by the Forest Service. Prior to the Devil's Kitchen Branch Bog being designated a rare community (9.F), the majority of the area's mesic hardwood forest was treated in the late 1970s, and white pine was planted (as plantations) in most of the harvested stands. Portions of these planted white pine stands are now located within the rare community. Illegal vehicle use was a problem in the past, but installation of tank traps has alleviated this problem in recent years. FSR 93 contributes some sediment to the site and Nepal grass, a non-native invasive species, is present. Woody vegetative encroachment has occurred over the years, reducing habitat suitability for species that prefer open wetland sites.

Scope of Analysis

The scope of analysis for available habitat, direct, indirect, and cumulative effects on rare communities includes the Paint Creek Analysis Area of Greene and Cocke Counties, Tennessee. The affected area includes those portions of Compartments 209 and 264 that are immediately adjacent to the Cutshall Bog and Devil's Kitchen Bog Rare communities. The timeframe considered for cumulative effects is the past five years to the future five years. Other activities in the area of consideration are listed in Table 3uu.

Table 3uu: Activities Considered in Cumulative Effects Analysis

Activity	Acres in Paint Creek Analysis Area	Past 5 years	Future 5 Years
Bellcow Mountain Burn	1818	No	Yes
Henry Ridge Burn	28	Yes	No
Phillips Hollow Burn	15	Yes	No
Hemlock Treatments	12	Yes	Yes
Paint Creek Trail	1	Yes	No
Wildfires/floods	unknown	Yes	Yes

Effects Analyses of the Alternatives

Alternative A (No Action)

Direct and Indirect Effects

No new activities are planned under this alternative. Conditions within these rare communities would fluctuate based upon ongoing activities (visitor use, road maintenance) and natural disturbances (storm damage, canopy gap creation). Woody encroachment, invasive species spread, and water flow problems at Cutshall Bog would continue and white pine would continue to increase within the midstory of the Devil's Kitchen Branch Bog rare community.

Cumulative Effects

There are no cumulative effects associated with Alternative A because no new actions would be implemented under this alternative. Future habitat conditions within the Cutshall Bog and Devil's Kitchen Branch Bog Rare communities would be the result of natural processes, ongoing activities, and past and future projects.

Alternative B (Proposed Action)

Direct and Indirect Effects

Direct impacts at the Cutshall Bog Rare Community would be the same as Alternative A, because no activities are proposed that would impact this rare community. Sediment deposition within the bog may decrease if road maintenance on Forest Service Road 93 takes place prior to implementation of the Devil's Kitchen prescribed burn.

The Devil's Kitchen Branch Bog rare community is located within the 478 acre Devil's Kitchen prescribed burn. Prescribed burning is not likely to reach the wettest portion of this community, but it would help reduce woody encroachment on adjacent upland sites. Burning would reduce the white pine component within the midstory, which would decrease the spread of this plant to other portions of the rare community. This would help maintain the more characteristic mesic hardwood component into the future. Sediment deposition within the bog may decrease if road maintenance on FSR 93 takes place prior to implementation of the Devil's Kitchen prescribed burn. This would improve conditions within the lower portion of the bog.

Cumulative Effects

None of the planned activities considered for cumulative effects analysis (Table 3uu) occur in close proximity to these rare communities. Therefore, no cumulative effects are expected from these actions. Short-term water rises as a result of past flooding have had no notable impacts on habitat conditions at these sites. Future flood events are expected to have similar impacts. A wildfire occurring within Cutshall Bog or the Devil's Kitchen Branch Bog would have little impact on bog habitat (too wet to burn), but would impact the surrounding forest conditions. Impacts would vary based upon the timing and intensity of the burn. These impacts would include opening up the midstory, a reduction in white pine in the midstory, potential for some loss of overstory trees, and a reduction in shading and competition along bog edges.

Alternative C

Direct and Indirect Impacts

Alternative C would result in several habitat improvements at Cutshall Bog. FSR 93 would be relocated around the upper edge of Cutshall Bog. The portion that bisects the bog would be removed returning a more natural water flow pattern within the bog. The section of road climbing the steep slope that is depositing sediment into the western portion of the bog would be abandoned. This would eliminate this source of sediment once vegetation is reestablished.

Alternative C would also treat encroaching vegetation mechanically and by using aquatic approved herbicides through direct application. Work would include activity within the bog and along bog edges and treat both invasive and native species. Activities would result in a redistribution of water throughout the bog and populations would fluctuate in response to the changing conditions. Implementation would improve habitat conditions for wetland species that prefer open to semi-open wetland conditions.

Alternative C would also improve conditions within the Devil's Kitchen Branch Bog rare community. In addition to the Devil's Kitchen prescribed burn, Alternative C would shelterwood harvest approximately 15 acres of white pine stands planted in the 1970's. These sites are located in the upper drainages and adjacent forest slope and not within the bog itself. Harvest would provide opportunities for invasive species establishment, but design criteria would be implemented to minimize this threat. Removal of planted white pine would reduce the pine component, and the stand would be managed to promote the diverse mesic hardwood forest characteristic of this site. This action is consistent with the forest plan by utilizing management activities to restore desired conditions within the rare community (Objective 9.F-1.02, USDA Forest Service 2004a, p. 144). Sediment deposition from FSR 93 would be reduced as this road is maintained in order to complete work in other portions of Compartment 209. Impacts of the Devil's Kitchen prescribed burn would be similar to those described under Alternative B.

Cumulative Effects

Cumulative effects at Cutshall Bog and Devil's Kitchen Branch Bog would be the same as those described under Alternative B.

Alternative D

Direct and Indirect Impacts

Direct and indirect effects at Cutshall Bog would be the same as Alternative C. Direct and indirect effects at Devil's Kitchen Branch Bog would be similar to Alternative C, but some of the activities have been changed. Under Alternative D, most of the shelterwood harvest (12 acres) proposed in Alternative C are replaced with group selection and thinning under this alternative. The three acres of early successional habitat created within the rare community (15 acre in Alternative C) would move the planted white pine stands towards a mesic hardwood condition.

Alternative D would add control of encroaching vegetation to activities at Devil's Kitchen Branch Bog. Actions would be the same as those described at Cutshall Bog under Alternative C. Wetland portions of this community that are being overgrown by small trees and shrubs would be the focus of treatment. Light conditions would increase following treatment, improving habitat conditions for plants and animals that occupy these sites.

Cumulative Effects

Cumulative effects at Cutshall Bog and Devil's Kitchen Branch Bog would be the same as those described under Alternative B.

Aquatic Resources

Affected Environment

The affected environment includes the tributaries of the French Broad River that are adjacent to and downstream of the proposed activities. Aquatic habitats in the analysis area include coldwater perennial streams (Table 3qq) and scattered wet-weather waterholes.

Table 3qq. Perennial Streams in Paint Creek Analysis Area

Stream Name	Fish Present
Brushy Branch	Rainbow trout
Courtland branch	Non-demand species
Cummins Branch	Brown trout
Devils Kitchen Branch	Non-demand species
Grassy Branch	Non-demand species
Hipps Branch	Unknown
Holly Creek	Rainbow trout
Paint Creek	Brown and Rainbow trout
Little Paint Creek	Brook, Brown, Rainbow Trout
Ricker Branch	Brown trout
Rough Branch	Brown trout
Little Rough Branch	Brook trout
Sawmill Branch	Brook, Brown, Rainbow Trout

Demand Species

Wild trout (rainbow, brown, and brook trout) can be found in less than 19 miles of coldwater streams (Table 3qq). *Brook trout*, the only trout native to Tennessee, occupy roughly five miles of these streams. The amount of habitat occupied by brook trout is likely reduced 50% or less from possible historical occupied habitat in the analysis area (Trout Unlimited 2006). This is a result of historical land uses over the last 200 years, particularly around the turn of the last century in East Tennessee. Populations fluctuate from year to year, but their overall trends are stable (USDA Forest Service 2004a). No rare aquatic species occur within affected areas.

Scope of Analysis

For aquatic species, the scope of analysis includes the tributaries listed in Table 3qq. The timeframe used for cumulative effects is five years past and future. This timeframe was chosen due to the limited time frame and minimal impacts project activities would have on aquatic resources.

Effects Analyses of the Alternatives

Alternative A (No Action)

Direct and Indirect Effects

Water quality is analyzed in detail the **Soil and Water** section of this EA.

Under Alternative A, deferring the maintenance of system roads may increase sediment in Brushy Branch, Devils kitchen Branch, Grassy Branch, Little Paint Creek, Paint Creek, Rough Branch, and Sawmill Branch potentially impacting aquatic resources and trout habitat. Deferring the decommissioning and subsequent actions of Shad Road (422) would also potentially impact aquatic resources and trout habitat. Sedimentation could cause a decrease in fish populations by smothering eggs, trapping young fish in the gravel, or preventing adult fish from escaping into the gravel during periods of high water flow and low water temperatures. Increased turbidity could cause a decrease in growth rates of sight feeders. Sediment carried downstream could scour algae and other tiny organisms from the rocks and streambed material, which would temporarily impact an important link in the food chain of the stream community (Filipek 1993).

Cumulative effects

The No Action alternative would have an adverse cumulative effect on aquatic resources including *wild trout*. When considered with unmaintained system roads and unauthorized roads and trails within the cumulative effects analysis area, Alternative A would continue to allow the movement of sediment into streams and tributaries due to erosion. Aggradation, or the deposition of sediment into the interspaces between gravel and cobble, would reduce habitat conditions for wild trout, other fishes, and invertebrates over time.

Alternative B (Proposed Action)

Direct and Indirect Effects

Wild Trout populations occur in nine of the thirteen streams in the affected areas (see Table 3qq). Four streams (ibid) support fish; however, they do not support trout. The proposed vegetation management actions (ESH creation, crop tree release, midstory and thinning) would have no effects to wild trout since aquatic habitats within riparian zones would be protected under RLRMP Standards for the establishment of streamside filter zones (USDA Forest Service 2004a). These standards provide for shade strips in harvested areas that would protect the streams from increases in sunlight and excessive fluctuations in water temperature (Sedell 1981).

There would be no stream crossings associated with the proposed temporary roads. Existing roads used for hauling, temporary and new road construction, skid trails, and log landings found in drainages adjacent to or downstream from stream reaches may cause a temporary increase in suspended sediment loading during implementation (Filipek 1993). However, compliance with RLRMP standards, including designating streamside filter zones, and Tennessee Best Management Practices would keep ground disturbance near streams to a minimum. These measures would protect wild trout and other fish, salamanders, and aquatic invertebrates from impacts due to sedimentation (USDA Forest Service 2004b). The proposed 11.4 miles of road maintenance and 0.1 miles of road reconstruction would help reduce sedimentation in the streams, improving conditions that influence wild trout productivity.

Alternative B would allow herbicide treatments across approximately 624 acres, or less than 4% of the analysis area. The toxicity ratings (SERA) for aquatic organisms are listed in Table 3ww. The following design criteria would minimize the risk of contamination to wild trout and other aquatic organisms:

- Mixing-water for herbicide use would be brought to the site by work crews and not obtained from streams or other bodies of water.
- No herbicide would be applied within 30 feet of open water except for selective treatments that use herbicides labeled for aquatic use.
- Specific methods would be used for application (thinline or stump treatments).
- Design criteria for herbicide use, e.g. timing to avoid rainfall would be used.

Table 3ww. Acute Toxicity Ratings for Aquatic Invertebrates

Herbicide	Acute Toxicity Rating
Glyphosate	Practically non-toxic
Imazapyr	Low
Triclopyr	Practically non-toxic

Alternative B would conduct low-intensity prescribed burns on approximately 1,955 acres in four burn blocks. These burns are intended to be "cool" or low intensity. Some small patches may burn intensely. If a heavy rain event occurs after burning before vegetation and cover are reestablished, erosion may occur in these areas and along fire lines, resulting in sedimentation in the streams (Elliott and Vose 2006). Sedimentation would have the same impacts on trout as discussed in Alternative B. Fire generally burns in a mosaic pattern; leaving patches of cove forests untouched. The remaining leaf litter and duff layer in moist areas along streams would

protect from sedimentation as a result of burning. Low intensity burns in the Southern Appalachians have been shown to have little impact to stream chemistry or sediment concentrations in streams (Elliot and Vose 2005). Only four steams would be impacted by the burns. Impacts to trout would be negligible.

Under Alternative B, five waterholes would provide ephemeral wetland and pond habitats. By being fish free, these habitats would be important for amphibians, crustaceans, and aquatic-dependent insect species such as dragonflies (Biebighauser 2003). Proposed restoration work at Allen Gap pond would improve aquatic habitat by increasing productivity of the wetland system.

Road authorization, wildlife opening creation, drumming log placement, and nest/bat box installation would have no effects to aquatic resources including wild trout.

Cumulative effects

Alternative B, in conjunction with past road maintenance, would have a positive cumulative effect on aquatic resources including *wild trout* populations. The activities have and would help reduce sedimentation loads, thereby increasing productivity in Brushy branch, Devils kitchen Branch, Grassy Branch, Little Paint Creek, Paint Creek, Rough Branch, and Sawmill Branch. However, weather events such as floods and droughts have major impacts on wild trout populations in the southern Appalachians (Strange and Habera 1995). Alternative B in conjunction with past prescribed burning would have a minimal cumulative effect on aquatic resources including *wild trout* populations.

Alternative C

Direct and Indirect Effects

Wild Trout populations occur in nine of the thirteen streams in the affected areas (see Table 3qq). The effects of the proposed vegetation management actions (ESH creation, crop tree release, midstory and thinning) would be the same as in Alternative B.

There would be no stream crossings associated with the proposed temporary roads. The proposed 17.1 miles of road maintenance and subsequent actions would help reduce sedimentation in the streams, improving conditions that influence wild trout productivity such as increase in food sources and improved spawning habitat. Road construction to eliminate the section of FSR 93 bisecting Cutshall bog would improve habitat and natural hydrologic regimes to the area.

Alternative C proposes herbicide treatments across approximately 590 acres, or less than 3% of the analysis area. Effects of herbicide treatments would be the same as those discussed under Alternative B.

Alternative C would conduct low-intensity prescribed burns on approximately 1,955 acres in four burn blocks. These effects would be the same as those discussed under Alternative B.

Creating five waterholes, scattered throughout the project area, would provide ephemeral wetland and pond habitats. Proposed restoration work at Allen Gap pond would improve aquatic

habitat by increasing productivity of the wetland system. Proposed work at Cutshall bog would improve aquatic habitat by allowing fish passage, restoring natural wetland characteristics to the wetland area, and improving water quality.

Road authorization, wildlife opening creation, drumming log placement, and nest/bat box installation would have no effects to aquatic resources including wild trout.

Cumulative effects

Cumulative effects of Alternative C would be the same as in Alternative B. Alternative C in conjunction with past prescribed burning would have a minimal cumulative effect on aquatic resources including *wild trout* populations.

Alternative D

Direct and Indirect Effects

Wild Trout populations occur in nine of the thirteen streams in the affected areas (see Table 3qq). The effects of the proposed vegetation management actions (ESH creation, crop tree release, midstory and thinning) would be the same as in Alternative B.

There would be no stream crossings associated with the proposed temporary roads. The proposed 16.2 miles of road maintenance and subsequent actions would help reduce sedimentation in the streams, improving conditions that influence wild trout productivity such as increase in food sources and improved spawning habitat. Road construction of FSR 93 to eliminate the section bisecting Cutshall Bog would improve habitat and natural hydrologic regime to the area.

Alternative D proposes herbicide treatments across approximately 1,063 acres, or less than 6% of the analysis area. Effects of herbicide treatments are discussed under Alternative B.

Alternative D would conduct low-intensity prescribed burns on approximately 1,955 acres in four burn blocks. These effects would be the same as alternative B.

Creating five waterholes, scattered throughout the project area would, provide ephemeral wetland and pond habitats. Proposed restoration work at Allen Gap Pond, Devil's Kitchen Bog and Rough Branch Beaver Pond would improve aquatic habitat by increasing productivity of the wetland system. Proposed restoration work at Cutshall bog would improve aquatic habitat by allowing fish passage, restoring natural wetland characteristics to the wetland area, and by improving water quality.

Road authorization, wildlife opening creation, drumming log placement, and nest/bat box installation would have no effects to aquatic resources including wild trout.

Cumulative effects

Cumulative effects of Alternative D would be the same as those in Alternative C.

Non-Native Invasive Species

Affected Environment

Several non-native invasive species (NNIS) occur in the Paint Creek Analysis Area. Abundance is above average compared to other areas across the CNF. Species diversity is high, but most NNIS occurrences are associated with existing road corridors, wildlife openings, trails, powerline right-of way, and boundaries with private land. NNIS species are also prevalent where past flood damage has occurred. Ten of the eleven NNIS tracked by the RLRMP were identified during surveys for this project (McGuiness 2013). Tracked NNIS species were found in 21 of the 24 sites surveyed (McGuiness 2013) and are listed in Table 3xx. Additional sites are known to occur within the analysis area. Other NNIS species not tracked by the RLRMP are also present. These include: Chinese silvergrass (*Miscanthus sinensis)*, Crown vetch (*Coronilla* varia), Bull thistle (*Cirsium vulgare*), Oriental bittersweet (*Celastrus orbiculatus*), and Oriental tearthumb *(Polygonum caespitosum*).

Table 3xx: Tracked NNIS of the Paint Creek Analysis Area

Common Name	Scientific Name	Tracked in RLRMP?	Survey Area Locations
Tree of Heaven	*Ailanthus altissima*	Yes	3
Small carpetgrass	*Arthaxon hispidus*	Yes	0
Autumn olive	*Eleagnus umbellata*	Yes	3
English ivy	*Hedera helix*	Yes	1
Sericea lespedeza	*Lespedeza cuneata*	Yes	10
Common Name	**Scientific Name**	**Tracked in RLRMP?**	**Survey Area Locations**
Privet	*Ligustrum sinense*	Yes	2
Japanese honeysuckle	*Lonicera japonica*	Yes	6
Nepal grass	*Microstegium vimineum*	Yes	16
Princess tree	*Paulownia tomentosa*	Yes	1
Kudzu	*Pueraria montana var.lobata*	Yes	1
Multifora rose	*Rosa multiflora*	Yes	11

Scope of Analysis

The scope of analysis for available habitat, direct, indirect, and cumulative effects on Non-native Invasive Species (NNIS) is the Paint Creek Analysis Area (PCAA). With the exception of forest visitors, this represents the area where most source populations of NNIS populations would originate. The timeframe for cumulative effects is the previous five years through five years after completion of the work. Other activities in the area of consideration are listed in Table 3yy.

Table 3yy. Other activities considered in cumulative effects analysis

Activity	Acres in Paint Creek Analysis Area	Past 5 years	Future 5 Years
Bellcow Mountain Prescribed Burn	1818	No	Yes

Henry Ridge Prescribed Burn	28	Yes	No
Phillips Hollow Prescribed Burn	15	Yes	No
Hemlock Treatments	12	Yes	Yes
Paint Creek Trail	1	Yes	No
Cummings Branch Borrow Pit	3	Yes	Yes
Wildfires/floods	unknown	Yes	Yes
Disturbance on private land	unknown	Yes	Yes

Effects Analyses of the Alternatives

Alternative A (No Action)

Direct and Indirect Effects

Some efforts have been made in the past to control NNIS in the analysis area. Most of these efforts have been focused on the road and utility corridors present in the area. Non-Native Invasive Species (NNIS) would continue to increase and displace native plants under this alternative. Most of the increase would occur along trails, forest edges, road corridors, power line right-of ways, and other disturbed areas. Use and maintenance of roads, power lines, trails, and wildlife openings in the area would result in some noxious weed control, but these areas would also serve as suitable habitat and vectors for spread in the area. Illegal trails and activities on adjacent private land would also serve as point sources for noxious weeds to enter the area. Naturally occurring disturbances as a result of storm damage, flooding, insect and disease, and natural mortality would also create opportunities for establishment within the Paint Creek Analysis Area. As NNIS populations expand and spread into previously uninfested areas, they would continue to erode forest productivity, hinder forest use and management, and degrade diversity and wildlife habitat (Miller et al. 2010).

Cumulative Effects

Hemlock treatments to combat the Hemlock Wooly adelgid would continue allowing some hemlocks to be retained within the Paint Creek Analysis area. Overall, hemlock populations would continue to decline as individuals succumb to this invasive insect.

Any ground disturbing activity, whether on Forest Service or other lands in the Paint Creek Analysis Area, provides an opportunity for NNIS species to become established or spread. Activities within the area (prescribed burns, trail construction, use of the borrow bit, wildfires and floods; road, trail, wildlife, and utility maintenance; and forest visitor use) and activities on adjacent private lands throughout the watershed have provided opportunities for NNIS establishment and spread. Planned prescribed burns would provide additional opportunities for NNIS establishment during and following implementation. Activities on adjacent private lands that result in ground disturbance would also provide opportunities for establishment based upon the new forest edges that are being created. Therefore, cumulative effects are expected under Alternative A because NNIS would likely continue to spread and/or become established in currently non-infested areas within the project area. These increases would be a result of other Forest Service activities, minimal treatment of existing infestations, forest visitor use, and activities on adjacent private lands within the analysis area.

Alternative B (Proposed Action)

Direct and Indirect Effects

Actions result in additional ground disturbance including: 0.3 miles of temporary road construction, 0.1 miles of reconstruction and 11.4 miles of pre-haul maintenance of existing roads, 377 acres of shelterwood harvest, 152 acres of thinning, 1,955 acres of prescribed burning, maintaining wildlife openings, restoration work at Allen Gap Pond, and construction of five vernal ponds. All of these actions would result in opportunities for further NNIS establishment and spread. Some of the activities overlap (ex. thinning and prescribed burning), which would provide multiple opportunities for establishment within the same area. Crop tree release (674 acres) and midstory treatments (95 acres) are expected to provide little opportunity for NNIS establishment. These activities do provide an opportunity to monitor and treat current NNIS populations within these stands. Placement of wildlife nest boxes, drumming logs, and authorization of 8.3 miles of roads already in use are expected to have negligible impacts on the distribution of NNIS species within the watershed. Decommissioning 3.7 miles of road would provide an opportunity to reduce or eliminate NNIS species at these sites.

If NNIS species are already present in the area, implementation would provide an opportunity for these populations to expand as a result of the changing habitat conditions and ground disturbance. Introduction of new NNIS species to a treatment area is also possible through equipment use, personnel, and dispersal into the area from adjacent sites. Several activities implemented under Alternative B border roads, trails, and/or private land. The probability of NNIS establishment and spread within these stands is high following treatment given their proximity to known NNIS sources.

Implementation is likely to increase the distribution of NNIS species in the project area. Nepal grass, multiflora rose, and other tracked NNIS species (Table 3xx) would be controlled with herbicides, along with other invasive species present in the proposed treatment areas. Design criteria for herbicide use would be implemented within treatment areas and along roads to reduce the spread of NNIS in the analysis area. Monitoring and follow-up treatments would be implemented to control future NNIS populations. Post treatment of NNIS species would give native vegetation a competitive advantage, which should further reduce opportunities for NNIS establishment and spread. Control and reduction of NNIS would improve habitats for native plants and wildlife forage, which in turn, would increase wildlife and native plant productivity.

Cumulative Effects

Some past efforts have been made to control NNIS species within the watershed. Hemlock treatments to combat the Hemlock Wooly adelgid would continue allowing some hemlocks to continue to survive within the Paint Creek Analysis area. Overall, hemlock populations would continue to decline as individuals succumb to this invasive insect.

Efforts in the future beyond those implemented with this project would likely be limited. NNIS are likely to increase under this alternative. Other activities occurring in the Paint Creek Analysis Area (see NNIS Cumulative Effects, Alternative A) would also provide opportunities for establishment and spread. Alternative B would help control past and future introductions and

would be one of the major contributor to the future distribution of NNIS within the analysis area. Development and management activities of other public and private land would also play a key role in the establishment, expansion, spread, and control of NNIS within the watershed. Under Alternative B, monitoring and opportunities for NNIS control would occur when planned activities overlap (ex. harvest and prescribed burning). NNIS would not be eliminated from the analysis area or CNF, but the actions would help control and reduce their rate of spread, ultimately benefitting the natural communities.

Alternative C

Direct and Indirect Effects

Alternative C proposes similar management activities to Alternative B, but adds 1.0 mile of road construction and restoration work at Cutshall Bog, a designated rare community on the Cherokee National Forest. The total acreage of early successional forest habitat created (302 acres), crop tree release (49 acres), and midstory treatments (84 acres) are reduced, but the amount of thinning (203 acres) is increased in this alternative. Implementation requires 17.1 miles of pre-haul maintenance and would decommission 4.7 miles of road. All other actions would be the same as Alternative B.

Relocating a portion of FS Road 93 would increase the abundance of NNIS species along the new route, providing opportunities for establishment into new areas. Decommissioning the existing section of FS Road 93 would reduce NNIS abundance along this route. The ability of this road to serve as a source point for NNIS species into lower Rough Branch and Cutshall Bog, a designated rare community, would also be greatly reduced. Restoration activities at Cutshall Bog would provide an opportunity to treat existing NNIS species. This would improve the quality of this rare community and improve habitat conditions for native species by reducing competition from NNIS.

Alternative C would implement Shelterwood harvest and thinning in Compartment 209, which do not occur under Alternative B. These activities would provide additional opportunities for NNIS establishment and spread within this area, including opportunities for spread within the Devil's Kitchen Branch rare community. Design criteria for herbicide use would be implemented within treatment areas and along roads to reduce the spread of NNIS in the analysis area. Monitoring and follow-up treatments would be implemented to control future NNIS populations.

Direct and indirect effects on NNIS are similar to those described under Alternative B. Land management activities combined with control of NNIS would improve habitats for native plants and wildlife forage. This would increase wildlife and native plant productivity by providing a diversity of habitat, age, and site conditions across the Paint Creek watershed.

Cumulative Effects

Cumulative impacts are similar to those described under Alternative B. NNIS would not be eliminated from the analysis area or CNF, but the actions would help control and reduce their rate of spread, ultimately benefitting the natural communities.

Alternative D

Direct and Indirect Effects

Alternative D proposes additional management activities resulting in the most ground disturbance of the four alternatives. Many of the areas treated under Alternative D are also treated under Alternative B or C. This alternative increases the total acreage of early successional forest habitat created (398 acres), and number of midstory treatments (513 acres) implemented. Alternative D adds 103 acres of group selection harvest and includes restoration work at two rare communities (Cutshall Bog and Devil's Kitchen Branch Bog) and two other wetland sites (Allen Gap Pond and Rough Branch Beaver Pond). Crop tree release, thinning, and other wildlife habitat improvements are the same as Alternative B. Implementation requires 16.2 miles of pre-haul maintenance. Construction, reconstruction, decommissioning, and authorization of roads would be the same as Alternative C.

The addition of group selection harvest and creating additional early successional would result in additional opportunities for NNIS establishment and spread within the watershed. Additional midstory treatments (herbicide treatment) would provide an opportunity for monitoring and treatment of NNIS species within these stands. Restoration work at four wetland sites would include NNIS treatments. NNIS populations should decrease within these sites improving habitat quality and conditions for native species occupying these wetland sites.

Direct and indirect effects on NNIS are similar to those described under Alternatives B and C. Overall, Alternative D impacts more acreage within the watershed by expanding management activities into additional stands. Some of the activities overlap (ex. thinning and prescribed burning, road decommissioning and restoration work), which would provide multiple opportunities for establishment within the same area.

Implementation is likely to increase the distribution of NNIS species in the project area. Design criteria for herbicide use would be implemented within treatment areas and along roads to reduce the spread of NNIS in the analysis area. Monitoring and follow-up treatments would be implemented to control future NNIS populations. NNIS populations within two rare communities (Cutshall Bog and Devil's Kitchen Branch Bog) and two other wetland sites (Allen Gap Pond and Rough Branch Beaver Pond) should decrease as a result of project activities. Land management activities combined with control of NNIS would improve habitats for native plants and wildlife forage. This would increase wildlife and native plant productivity by providing a diversity of habitat, age, and site conditions across the Paint Creek watershed.

Cumulative Effects

Cumulative impacts would be similar to those described under Alternative B. Some past efforts have been made to control NNIS species within the watershed. Efforts in the future beyond those implemented with this project would likely be limited. NNIS are likely to increase under this alternative. Other activities occurring in the Paint Creek Analysis Area (see NNIS Cumulative Effects, Alternative A) would also provide opportunities for establishment and spread. Alternative D would help control past and future introductions and would be one of the contributors to the future distribution of NNIS within the analysis area. Development and management of other public and private land would also play a key role in the establishment,

expansion, spread, and control of NNIS within the watershed. Under Alternative D, monitoring and opportunities for NNIS control would occur when planned activities overlap (ex. harvest and prescribed burning). NNIS would not be eliminated from the analysis area or CNF, but the actions would help control and reduce their rate of spread, ultimately benefitting the natural communities.

Scenery Resources

Agency Direction

The USDA Scenery Management System (USDA Forest Service 1995) is used to inventory, evaluate and disclose effects to Scenery Resources of the Cherokee National Forest (CNF). During the planning process for the CNF *Revised Land and Resource Management Plan* (RLRMP), existing Scenery Resource inventories were updated. Forest landscapes were evaluated on scenic attractiveness, concern levels, and viewing distances from identified travel-ways and viewing platforms, i.e. roads, trails and recreation sites. Inventoried areas were then assigned a Scenic Class number based on this information.

Affected Environment

The Paint Creek project area includes landscapes inventoried as Scenic Classes 1, 2, 3 and 5. In general, these scenic classes represent landscapes that are high to moderately valued for their natural aesthetic appeal and as settings for outdoor recreation. For example, Scenic Classes 1, 2 and 3 include views of the national forest from various USFS system roads, TN State Highways 70 and 107 and the Appalachian National Scenic Trail (A.T.). Scenic Class 5 represents areas of the National Forest that are sometimes less attractive than other inventoried landscapes or, in the case of the Paint Creek Project, seldom viewed.

Management Prescriptions in the RLRMP prescribe a Scenic Integrity Objective (SIO) for each inventoried Scenic Class. "Scenic Integrity" is measured by "the degree to which a landscape is visually perceived to be 'complete.' The highest scenic integrity ratings are given to those landscapes that have little or no deviation from the character valued by constituents for its aesthetic appeal" (USDA Forest Service 1995, p. 2-1). Based on management prescription, viewing distance and user interest within the project area, the RLRMP provides objectives to attain moderate levels of scenic integrity for the project area.

Landscape visibility is a function of many interconnected considerations including: (1) context of viewers, (2) duration of view, (3) degree of discernible detail, (4) seasonal variations, and (5) number of viewers (USDA Forest Service 1995, p.4-2). Major and minor travel-ways, including highways, trails, developed recreation sites, and county and forest roads provide potential foreground, middleground and background views into the Paint Creek project area. The quality of scenery viewed from these travel-ways directly contributes to the quality of a visitor's recreation experience. Travel-ways in close proximity to the Paint Creek project area include:

- TN State Highway 70 bisects the Paint Creek Project Area and provides access to recreation opportunities associated with the Paint Creek Corridor, Green Mountain and

Camp Creek Bald. Also, the route provides direct access to trailheads associated with the A.T. There are potential foreground and middleground views into the project area.

- TN State Highway 107, located just northwest of the project area, provides access to the Paint Creek Corridor and affords potential foreground and middleground views into the project area.

- South of TN Highway 70, lower Paint Creek Road (FSR 41), a popular water based recreation destination corridor during the summer months, provides direct access to Paint Creek Campground and other FSR's within the project area including Paint Mountain Road (FSR 54) and Hurricane Gap Road (FSR 31). North of TN Highway 70, Upper Paint Creek (FSR 42), Upper Rough Branch (FSR 93) and Green Mountain (FSR 98) Roads provide general forest access to Green Mountain and Camp Creek Bald. There are potential foreground and middleground views into the project area from each of these roads and sites.

- The Appalachian National Scenic Trail traverses the southern boundary of the project area along the crest of the Bald Mountain range, also the Tennessee/North Carolina state line. The A.T., an internationally renowned, nationally-designated foot trail, is used by approximately 1,200 thru-hikers each year and is part of a popular day hike from nearby Hot Springs, North Carolina. As well, the trail is easily accessible from TN State Hwy 70 at Allen Gap, from Hurricane Gap Road (FSR 31) at Hurricane Gap and from Upper Paint Creek Road (FSR 42) near Camp Creek Bald. There are potential foreground and middleground views into the project area.

Other lower travel-ways and use areas that provide viewing platforms into the project area such as various points along trails and closed forest roads, provide opportunities for foreground and middleground views to the project area.

National Forest System lands are predominately natural-appearing in this area, while local communities/private lands can be characterized as pastoral/agricultural and/or rural/forested landscapes that provide short to long-range views of the affected landscape.

Scope of Analysis

The scope of analysis for the direct and indirect effects includes inventoried Scenery Resources within the Paint Creek project area, as identified in *Affected Environment* above, that are visible from noted travel-ways and viewing platforms (see Appendix G). The expected changes or alterations to affected Scenery Resources are described in terms of being consistent or inconsistent with the SIOs, as specified in the RLRMP.

SIOs set the thresholds or limitations for creating alterations to the existing natural appearing landscapes. These alterations are typically a result of implementing actions such as silvicultural treatments, wildlife habitat improvements, road construction, prescribed fire, etc. The proposed actions would be considered consistent with SIOs if they meet the following descriptions within one to five growing seasons after implementation:

- VERY HIGH – The valued landscape character remains intact with only minute if any deviations. The sense of place is expressed at the highest possible level.

- HIGH – Deviations created by humans (such as proposed silvicultural treatments, road construction, prescribed fire, etc.) may be present but repeat the form, line, color, texture and pattern common to the landscape character so completely and at such scale that they are not evident and the landscape appears unaltered.

- MODERATE – Noticeable deviations created by human alterations remain visually subordinate to the natural appearing landscape being viewed and create only a slightly altered appearance.

- LOW – Noticeable deviations created by human alterations begin to dominate the landscape being viewed but they borrow valued attributes such as size, shape, edge effect and patterns of natural openings and vegetative type changes. Alterations create only a moderately altered appearance. (USDA Forest Service, 1995, p. 2-4)

The timeframe for the direct and indirect analysis ranges from the time harvesting activities would take place to approximately 15 years beyond that point. Short-term effects include impacts associated with project implementation, and would occur up to one year after completion. This timeframe typically allows the site to be stabilized following a land disturbing activity and for initial slash treatments to become less noticeable. Long-term effects are considered from the time the short term period ends until 15 years into the future. This would be the approximate time needed for the harvested areas to regain tree crown cover.

Cumulative effects common to scenery resources would have the greatest potential impact within the immediate vicinity of Paint Creek Project's proposed silviculture treatments. The cumulative effects analysis includes NFS and private lands within the following area: The Greene County/Cocke County line to the southwest, the Ridge of Meadow Creek Mountain to Kelly Gap Road and Mountain Road to the northwest, the Dry Creek tributary to the northeast, and the Tennessee North Carolina border to the southeast. This area encompasses approximately 35,000 acres.

The following vegetation management activities have taken place in the cumulative effects analysis area within the past 10 years:

- Mast tree release with chainsaws, approximately 600 acres.
- 12 acres of treatments to control Hemlock Wooly Adelgid infestations.
- Chemical treatments of non-native invasive vegetative species.
- Prescribed burning of 6,275 acres (see below):

Burn Unit	Year	Burn Unit Total Acres	Acres w/in Paint Creek watershed
Bellcow Mountain	2004	1,818	1,818
Cummins Branch	2004	1,511	778

Spring Mountain	2005	1,541	1,541
Lone Pine Gap	2007	1,103	1,103
Horsehitch Gap	2008	23	23
Henry Ridge	2009	1,050	28
Phillips Hollow	2009	1,176	15
Brushy Branch	2011	1,136	969
Totals		**9,358**	**6,275**

In addition, approximately 65 acres of wildfires have occurred in the analysis area from 2004 to 2012. Individual fires ranged from < one acre to 60 acres in size.

Reasonably foreseeable future actions in the cumulative effects analysis area within the next 10 years include reburning the 1818-acre Bellcow Mountain prescribed burn block. Treating non-native invasive species, maintaining wildlife habitat improvements (primarily wildlife openings), and routine maintenance of existing system roads and trails would continue to occur. Illegal ATV and other off-road motorized uses would continue to threaten resources in the general forest environment including scenic integrity, and any damage(s) to the resource(s) may need to be remediated.

Past timber harvests, clearings, roads, structures and other landscape modifications are visible on private lands within the cumulative effects analysis area. The degree to which these modifications on private lands impact scenic quality varies by type, scale and contrast with the surrounding natural landscape. Potential future scenery impacts in the analysis area include increased residential development and gradual loss of the pastoral/agricultural and rural/forested landscape character.

Effects Analyses of the Alternatives

Project-level analysis was conducted in two ways: field reconnaissance from identified travel-ways and terrain modeling using GIS applications. A spatial analysis helped determine the areas in affected compartments that are potentially visible from identified viewing platforms. This analysis was based on terrain only, but with field verification at the project level.

Scenery design features have been developed to help achieve SIOs as described above. For this analysis, the scenery design features are considered as part of the proposed actions in Chapter 2 of the environmental assessment (EA). They primarily address activities related to proposed silvicultural treatments and wildlife habitat improvements. Refer to Appendix G for a listing of "Recommended Scenery Design Features for Areas Visible from Noted Travelways & Viewing Platforms." The direct and indirect effects to Scenery Resources have been based on the assumption that these design features would be implemented to the extent practicable to achieve the assigned SIOs. For example, a design feature might recommend that log landings be strategically located to avoid being conspicuous from a noted travelway.

The resiliency of vegetation in the Southern Appalachian Mountains has also been taken into consideration when disclosing the temporal nature of effects to Scenery Resources, the

consistency with assigned SIOs and the application of scenery design features. For example, a design feature may recommend the lopping and scattering of slash to a height of four feet or less from the ground if viewed within 100-feet from a noted travelway. The visual effect of scattered down woody debris at this height would noticeably diminish within the first year due to rapid decomposition and growth of surrounding seedlings and saplings. The affected areas would most likely meet a Moderate SIO during the second or third growing season after implementation and a High SIO during the fifth growing season. Direct, Indirect and Cumulative effects of the alternatives on Scenery Resources are provided below.

Alternative A (No Action)

Direct and Indirect Effects

Under this alternative, the proposed action would not be implemented. There would be no enhancement or restoration efforts to improve scenery or create visual diversity, either short or long term, which would affect scenery resources. Emergency forest health and safety projects (such as salvage harvest after a fire or an insect/disease outbreak) may be implemented, but actions to improve the overall health of the forest would not be implemented. Natural processes would continue to alter the appearance of the landscape (and Scenery Resources) within the project area at various scales over time. The overall effect of the this alternative would be no modifications to the existing natural-appearing landscape. SIOs of "Moderate to High" in the project area would continue to be met under this Alternative.

Cumulative Effects

No cumulative effects on Scenery Resources are anticipated under this alternative.

General Discussion Relative to Alternatives B, C and D

For all action alternatives**,** the table in Appendix F2 identifies Stand number, Management Prescription, assigned SIO, Proposed Treatment type and visibility from analyzed viewing platforms and travel-ways. As indicated in the "Viewing Platform" column, stands may be seen from more than one viewing platform; this combined effect is considered during analysis.

Scenery design features common to all stands include feathering unit boundaries to avoid straight edges; retaining natural-appearing groups of trees; minimizing soil disturbance so constructed features like roads and skid trails blend and remain subordinate to the landscape; screening log landings from view, with restoration of the area as close to the original landscape as practical. When the desired landscape character is "natural appearing," the appearance of a continuous forested canopy would be achieved by retaining trees at intervals throughout the stand, based on the prescribed basal area (BA) and refined in the field prior to implementation.

Leaving a higher tree density in areas closest to the viewer and especially along ridgelines and travel routes reduces textural and color contrasts between the treated area and adjacent forest. Also, retaining several vertical feet of vegetation along skyline ridges maintains the continuous effect of a natural-appearing forest. Edge-feathering reduces or eliminates shadow-lines along unit boundaries. These and other design features effectively soften visual impacts of timber

harvesting and allow assigned SIOs to be met.

When viewed as 'Middleground' (0.5 to 4.0 miles from the viewing platform), shelterwood harvest areas may appear to be more sparsely vegetated or have fewer trees than adjacent uncut stands, but do not create a distinct opening as with clear-cut harvests (not proposed). To the average viewer, a shelterwood harvest of 15-20 square feet basal area (ba)/acre may be noticeable for ten or less years after harvest, while a 30+ square feet ba/acre treatment may be noticeable for a shorter time. An area with a higher reserve basal area, a denser canopy cover and a greater number of remaining tree stems would be less noticeable when over-viewing the forested canopy. In leaf-on season, Middleground views of shelterwood harvest treatments may allow varying degrees of visible ground beneath the remaining overstory trees or individual stems may be more distinct. In certain lighting conditions, shadows beneath residual trees may make the stand appear darker and have a more coarse texture than the adjacent forest. Within two or three growing seasons, crowns of residual overstory trees expand to create a denser canopy, and understory vegetation grows to obscure views of ground exposed during harvest. In leaf-off, shelterwood harvest treatments appear more like adjacent un-cut stands, except for the tree density. However, roads, log landings and logging debris may be more noticeable.

In general, visitors walking or driving in the remote parts of the forest where these activities are proposed would notice the following effects of harvesting: decreased canopy cover; increased sunlight; increased visibility into the forest; damaged living vegetation from logging activities; and visible debris, stumps and root wads on the ground. The height of remaining slash (debris, stumps and root wads) would range four feet or less in height, depending on the area's SIO and visibility from noted travel-ways. After a harvest, forest visitors would notice the effects of manual site preparation, chemicals and prescribed burning, techniques used to eliminate undesirable species and promote desired tree species. These activities would produce additional downed woody debris, scorched vegetation from burning and a more open forest.

Post harvest evaluation by specialists would determine visibility of road and skid trail banks and beds within treatment areas. If necessary, additional treatments would be used to reduce harvest-related alterations of established form, line, color and texture.

Note: The cumulative effects analysis for all three alternatives is found after Alternative D's direct and indirect effects analysis.

Alternative B (Proposed Action)

Actions proposed in Alternative B that would affect Scenery Resources include silvicultural treatments, wildlife habitat improvements, transportation improvements and prescribed fire.

Silvicultural Treatments

377 acres (17 stands) are proposed for early successional forest habitat creation through a Two – Age Regeneration Harvest (Shelterwood with Reserves). Additionally, 674 acres (32 stands) are proposed for crop tree release, 95 acres (two stands) for midstory treatment and 152 acres (eight stands) for thinning, of which 27 acres (two stands) would be thinned noncommercially.

Converting existing forested areas to early successional forest would create the most noticeable impacts to the existing forest scenery. Some visitors may notice the tree removal for gap creation due to openings created in the tree canopy and the color contrast of disturbed soil. These contrasts would be expected to diminish after each growing season as regenerating hardwood trees occupy the openings. To the average viewer, a shelterwooded stand with a residual basal area of 15-20 square feet per acre may be noticeable for ten or less years after harvest.

In the short term, pre- and post-harvest site preparation for early successional forest creation and thinning, and the midstory treatments, would have the most noticeable effect on the scenic resource, particularly in the immediate foreground of travelways. Brown leaves and dead stems that result from herbicide treatments would be evident for a growing season or less, but the opening of the stands would have positive long-term effects on scenery, wildlife viewing and hunting overall. Treating the non-native invasive species in these stands would also have a positive long-term effect on the scenery resources of this area by maintaining and improving habitat for native Appalachian mountain flora. Established SIOs would only be affected one growing season or less after herbicide application due to an unseasonable leaf drop.

Crop tree release, midstory reduction and thinning would have a positive effect on the scenery in the area by increasing the depth of views into the forest. These activities would produce additional downed woody debris, noticeable for a growing season or less after harvest.

Wildlife Habitat Improvements

This alternative proposes to create drumming logs and wildlife watering holes, and place roosting/nesting boxes for birds and other wildlife within the project area. These features would draw wildlife to the area, a positive long-term effect on recreation opportunities for hunting and wildlife viewing. In addition, noncommercial thinning is proposed for two stands at Allen Branch Pond to reduce shading effects and improve wildlife habitat for rare species. Design feature recommendations would include cutting slash closer to the ground for areas in close proximity to the ponds. The proposed wildlife habitat activities would have little or no effects to recreation and scenery resources. Established SIOs would only be affected in the short term (one growing season or less) after implementation.

Transportation Improvements

The proposed 11.4 miles of prehaul maintenance and 0.1 miles of road reconstruction would expose previously undisturbed areas of mineral soil, increasing viewshed visibility of the roads. However, this would have minimal long-term impacts to scenery resources in the area.

The proposed construction of 0.3 miles of temporary roads would provide visual diversity and would afford views of the surrounding landscape. Where temporary roads coincide with existing trails, design features recommend the retention of vegetative buffers and retention of large trees in the immediate foreground to help frame views and reduce scenery impacts in the immediate foreground. Even with obliteration and seeding, temporary roads are distinguishable as corridors because of residual cut banks, lost canopy and flattened roadbed. Efforts would be made to restore temporary roads to their predevelopment contour and design features recommend

reseeding and planting to reduce scenery impacts. Direct effects would diminish each year as growing seasons pass, new saplings emerge, and leaf litter accumulates within the project area. The affected scenery would remain natural appearing and consistent with the assigned SIO of moderate to high within the project area.

Decommissioning 3.71 miles of authorized and unauthorized roads would have a long-term positive effect on scenery, wildlife and recreation. Decommissioned roads would revegetate over time, and would contribute to the area's natural-appearing landscape, would provide habitat for edge species, and would improve opportunities for hunting and wildlife viewing.

Approximately 8.31 miles of existing roads would be added to the Forest Service transportation system, per the Paint Creek Travel Analysis Plan. Since the roads currently exist on the ground, no additional impacts to scenery resources would occur and the assigned SIO's would be met.

Prescribed Fire

This alternative proposes approximately 1,955 acres of prescribed burning in four burn blocks for purposes of promoting the health of forest communities. Prescribed burning would reduce the amount of fuels that contribute to wildfires, would promote forest health, and would provide wildlife benefits by renewing the mid- and understory vegetation. The proposed Devil's Kitchen burn, in particular, would help restore and maintain the existing bog/rare community and promote a mesic hardwood forest type.

Short-term effects to scenery from the prescribed burns would be scorched vegetation, usually lasting only a few weeks, and ground disturbance associated with dozer- and hand-constructed firelines. Design features such as seeding and stabilizing dozer and hand lines following the proposed activity would reduce the short-term impacts of ground disturbance. Effects would diminish each year as growing seasons pass, new saplings emerge, and leaf litter accumulates within the project area. The resulting openings would provide visual diversity and afford views into the surrounding landscape.

Effects of prescribed fire over a longer period of time (immediately to a few years) would be a reduction in downed woody debris and a more open forest, changes that benefit those users who enjoy hunting, wildlife viewing and longer views into the natural-appearing woodland. Established SIOs would be affected only in the short term (one growing season or less) after implementation. The affected scenery would remain natural appearing and consistent with the assigned SIO of moderate to high within the project area.

Alternative C

Actions proposed in Alternative C that would affect Scenery Resources include silvicultural treatments, wildlife habitat improvements, transportation improvements and prescribed fire.

Silvicultural Treatments

Effects on scenery resources from early successional forest habitat creation would be similar to those described for Alternative B, but on a slightly smaller scale due to fewer acres proposed to be treated, 302 acres versus 377 acres (Alternative C and B, respectively). Unlike Alternative B,

however, which would create ESF only through commercial timber harvest, Alternative C stipulates that "…depending on market conditions and other economic factors, some stands may be treated noncommercially". This would reduce the effects associated with heavy equipment use during commercial timber harvest.

Of the 302 acres proposed for shelterwood treatment, 15 acres (three stands) lie within the upland portion of the Devil's Kitchen Branch Bog rare community (Prescription 9F). The action would help restore the rare community by removing the current white pine plantation affect, reducing the density of white pine, a source for white pine encroachment in the area of the bog, and by promoting a mesic hardwood forest type.

Alternative C also proposes 49 acres (three stands) of crop tree release, 84 acres (three stands) of midstory treatment, and 203 acres (14 stands) of thinning. The acreage proposed for noncommercial thinning would drop from 27 acres in Alternative B to 21 acres in Alternative C.

As with pre- and post-harvest treatments for shelterwooded stands, unseasonable leaf drop from the midstory treatments would have the most noticeable effect on the scenic resource in the short term, particularly in the immediate foreground of travel-ways. Noncommercial silviculture treatments would have the same result as commercial treatments of increased depth of views into the forest but would result in more downed woody debris than commercial treatments. Brown leaves and dead stems that result would be evident for a growing season or less, but the opening of the stands would have positive long-term effects on scenery, wildlife viewing and hunting. Shelterwood treatments within the Devil's Kitchen Branch Bog would help restore plant diversity and would increase visual interest to the bog and surrounding landscape. Scenery design features to meet Moderate to High SIOs are the same as those for Alternative B.

Wildlife Habitat Improvements

This alternative proposes the same Wildlife Habitat Improvements as Alternative B with the exception of work proposed work at Cutshall Bog. These features, including the control of woody vegetation around the bog, would draw wildlife to the area, a positive long-term effect on recreation opportunities for hunting and wildlife viewing. Proposed wildlife habitat activities would have little or no effects to recreation and scenery resources. Established SIOs would only be affected in the short-term (one growing season or less) after implementation.

Transportation Improvements

The effects of the proposed 11.4 miles of pre-haul road maintenance, 0.1 miles of road reconstruction and 0.3 miles of proposed temporary road construction under Alternative C on scenery resources would remain the same as that discussed in Alternative B. Scenery design features to meet Moderate to High SIOs for the proposed pre-haul, reconstruction and temporary roads would be the same as Alternative B.

Alternative C proposes the decommissioning of 4.04 miles of authorized and unauthorized roads and adding approximately 8.31 miles of existing roads to the Forest Service transportation system, the same as Alternative B. Scenery design features to meet Moderate to High SIOs for the proposed decommissioning of authorized and unauthorized and adding roads to the system would have the same effects as those described in Alternative B.

Alternative C proposes the construction of 1.0 miles of new road (FSR 93) for purposes of redirecting forest access around the Cutshall Bog. A newly constructed road would improve access to the forest for recreation, would provide visual diversity and would afford views to the surrounding landscape as well as help protect the sensitive habitat at Cutshall Bog (along the current route of FSR 93) but would require that an undisturbed corridor be cut, graded and hardened to allow for vehicular traffic. This activity would expose previously undisturbed areas of mineral soil and create a distinguishable corridor because of residual cut banks, lost canopy and flattened roadbed. Also, permanent road construction would impact the ability of the area to heal itself and become a part of the natural-appearing landscape. However, the proposed road would be located on a more sustainable alignment than the current road and would allow decommissioning of a section of road that is currently not sustainable. To protect area SIOs of Moderate and High, road maintenance and construction would be designed to minimize their visibility from affected viewing platforms and travel-ways. As well, design features recommend reseeding and planting to reduce scenery impacts. Direct effects would diminish each year as growing seasons pass, new saplings emerge, and leaf litter accumulates within the project area. The affected scenery would remain natural appearing and consistent with the assigned SIO of moderate to high within the project area.

Prescribed Fire

This alternative proposes prescribed fire for 1,955 acres in four burn blocks for purposes of promoting the health of forest communities, the same as that proposed in Alternative B. In particular, prescribed fire within the Devil's Kitchen Branch Bog would help restore and maintain the existing rare community and promote a mesic hardwood forest type. Scenery design features to meet Moderate to High SIOs for the proposed prescribed fire would have the same effects as those described in Alternative B.

Alternative D

Actions proposed in Alternative D that would affect Scenery Resources include silvicultural treatments, wildlife habitat improvements, transportation improvements and prescribed fire.

Silvicultural Treatments

Effects on scenic resources for early successional forest habitat creation using the shelterwood treatment method would be similar to those described for Alternative B, but on a slightly bigger scale due to the increased number of proposed treatment acres, 398 acres versus 377 acres in Alternatives D and B respectively. Of the 398 acres proposed for shelterwood treatment, 3 acres (three stands) lie within the Devil's Kitchen Branch Bog which is designated as a rare community (Prescription 9F). In addition, Alternative D stipulates: "depending on market conditions and other economic factors, some stands may be treated noncommercially".

Alternative D also proposes a crop tree release for 674 acres (32 stands), equal to that proposed in Alternative B, midstory treatment for 513 acres (15 stands), up from 95 acres in Alternative B and thinning for 125 acres (six stands), down from 152 acres proposed in Alternative B. The acreage proposed for noncommercial thinning would equal 27 acres, the same as that proposed in Alternative B.

As with pre- and post-harvest treatments for shelterwooded stands, unseasonable leaf drop from the midstory treatments would have the most noticeable effect on the scenic resource in the short term, particularly in the immediate foreground of travel-ways. Noncommercial silviculture treatments would have the same result as commercial treatments of increased depth of views into the forest but would result in more downed woody debris than commercial treatments. Brown leaves and dead stems that result would be evident for a growing season or less, but the opening of the stands would have positive long-term effects on scenery, wildlife viewing and hunting. Shelterwood treatments within the Devil's Kitchen Branch Bog would help restore plant diversity and would increase visual interest to the bog and surrounding landscape. Scenery design features to meet Moderate to High SIOs are the same as those for Alternative B.

Wildlife Habitat Improvements

This alternative proposes the same Wildlife Habitat Improvements as Alternative B with the exception of work proposed work at Cutshall Bog, Devil's Kitchen Bog and Rough Branch Beaver Pond. These features, including the control of woody vegetation around the bogs and pond, would draw wildlife to the area, a positive long-term effect on recreation opportunities for hunting and wildlife viewing. Proposed wildlife habitat activities would have little or no effects to recreation and scenery resources. Established SIOs would only be affected in the short-term (one growing season or less) after implementation.

Transportation Improvements

The effects of the proposed 16.2 miles of pre-haul road maintenance, 0.1 miles of road reconstruction and 0.3 miles of proposed temporary road construction under Alternative C on scenery resources would remain the same as that discussed in Alternative B. Scenery design features to meet Moderate to High SIOs for the proposed pre-haul, reconstruction and temporary roads would be the same as Alternative B.

Alternative D proposes the decommissioning of 4.70 miles of authorized and unauthorized roads, one mile more than proposed in Alternative B, and adding approximately 8.31 miles of existing roads to the Forest Service transportation system, the same as Alternative B. Scenery design

features to meet Moderate to High SIOs for the proposed decommissioning of authorized and unauthorized and adding roads to the system would have the same effects as those described in Alternative B.

Alternative D proposes the construction of 1.0 miles of new road (FSR 93) for purposes of redirecting forest access around the Cutshall Bog. A newly constructed road would improve access to the forest for recreation, would provide visual diversity and would afford views to the surrounding landscape as well as help protect the sensitive habitat at Cutshall Bog (along the current route of FSR 93) but would require that an undisturbed corridor be cut, graded and hardened to allow for vehicular traffic. This activity would expose previously undisturbed areas of mineral soil and create a distinguishable corridor because of residual cut banks, lost canopy and flattened roadbed. Also, permanent road construction would impact the ability of the area to heal itself and become a part of the natural-appearing landscape. However, the proposed road would be located on a more sustainable alignment than the current road and would allow decommissioning of a section of road that is currently not sustainable. To protect area SIOs of Moderate and High, road maintenance and construction would be designed to minimize their visibility from affected viewing platforms and travel-ways. As well, design features recommend reseeding and planting to reduce scenery impacts. Direct effects would diminish each year as growing seasons pass, new saplings emerge, and leaf litter accumulates within the project area. The affected scenery would remain natural appearing and consistent with the assigned SIO of moderate to high within the project area.

Prescribed Fire

These alternatives propose prescribed burning 1,955 acres in four burn blocks for purposes of promoting the health of forest communities, the same as that proposed in Alternative B. In particular, prescribed fire within the Devil's Kitchen Branch Bog would help restore and maintain the existing rare community and promote a mesic hardwood forest type. Scenery design features to meet Moderate to High SIOs for the proposed prescribed fire would have the same effects as those described in Alternative B.

Cumulative Effects for Alternatives B, C and D

When considered with the proposed vegetation management actions under Alternatives B, C and D, past actions, e.g. herbicide treatments for NNIS and HWA, midstory treatments, and prescribed burns since 2004, would have beneficial long-term cumulative effects on the Scenery resources within the analysis area.

Vegetation management actions planned within the next 10 years that would affect the Scenery resource includes the approximately 1818-acre Bellcow Mountain prescribed burn. The short-term cumulative effect would be scorched vegetation and blackened tree trunks. However, it is unlikely that multiple burn blocks would be treated at the same time, i.e. within the same year or years. This would essentially stagger the effects both spatially and temporally within the analysis area, thereby reducing the overall impacts on the Scenery resources. Long term, the resulting more open forest would benefit both scenery and recreation by creating a more natural-appearing woodland. There are no other vegetation management actions planned in the analysis area within the next 10 years.

The wildlife habitat improvements and transportation improvements under all three alternatives would have long-term beneficial cumulative impact when considered with similar future actions. The increase in wildlife-viewing and hunting opportunities, and visual and viewshed diversity would provide recreation users with a more enjoyable experience when visiting FS lands.

Cumulatively, although there would be short-term impacts, management-influenced SIOs would continue to be met over the long term.

Recreation Resources

Affected Environment

Visitors to the Unaka Ranger District choose the area's mountain settings to engage in a variety of popular recreation activities including, but not limited to hiking, biking, horseback riding, picnicking, camping, backpacking, hunting, fishing, sightseeing (wildlife and scenery) and driving for pleasure. The project area, located between Paint Mountain and the Bald Mountains, provides opportunities for many of the recreation activities mentioned above. The project area includes the southern portion of the Bald Mountain Recreation Zone and the northern portion of the French Broad Recreation Zone. Prominent travel corridors provide additional access to developed and dispersed recreation opportunities.

Per the RLRMP, five recreation-associated prescriptions are found within the project area:

- A 14-mile section of the Appalachian National Scenic Trail (AT) (Prescription 4.A) between Camp Creek Bald and Rich Mountain Fire Tower is along the eastern boundary of the project area. The AT attracts local, national and international visitors throughout the year; however most visitation occurs in the spring.

- Forest Service Road 41 (FSR 41), more commonly known as the Paint Creek Corridor (PCC), is found in Prescription 7.B (Scenic Corridors.) Being in close proximity to Paint Creek, and offering views of rock cliffs and minor waterfalls, the PCC is used by people driving for pleasure and as a dispersed recreation area. Activities such as dispersed camping and fishing, both cold-water (Paint Creek) and warm-water (Paint Creek Pond), are also popular.

- Paint Creek Campground, found within the Paint Creek Corridor and located in Prescription 7.D (Concentrated Recreation Zone), is a twenty-one site facility, with several picnic areas (a total of 19 tables). The campground is one of the Unaka Ranger District's most popular recreation areas. The Paint Creek Campground Trail, a 1.0-mile hiking trail, loops around Paint Creek Campground, and a short 0.1-mile trail connects the picnic areas found along the creek.

Additional areas designated as 7.D in the PCC include; the Moses Turn parking area and two picnic/day-use areas (Overlook and Paint Creek).

- Prescription 7.E.2 (Dispersed Recreation Areas) is located north of Tennessee Highway 70, primarily in the vicinity of the Rich Mountain area. Recreational uses in the area include day hiking, mountain biking, horseback riding, dispersed camping, hunting, nature study, and nature photography.

- Approximately 1,500 acres of the Greene Mountain area are in Prescription 12.A (Remote Backcountry Recreation-Few Open Roads). The area provides the public with a relatively large tract of land for backcountry experiences. The few open roads present are found along the periphery of the area, but several closed roads provide access to the interior. The Greene Mountain Trail (#13), a 3.7-mile multi-use trail running along the ridgetop, is part of the northeast boundary of the project area.

There are two additional management prescriptions in the project area that, although not recreation-oriented, still contain/provide recreational opportunities:

- There are a number of trails within Prescription 8.C (Black Bear Habitat Management): the Paint Mountain Trail (#7), an 8.4-mile multi-use trail; the Chimney Rocks Trail (#154), a 2.9-mile multi-use trail; the Paint Rock Trail (#154A), a 1.3-mile multi-use trail; the Paint Creek Trail, (#10), a 4.4-mile hiking trail; and the Little Paint Creek Trail (#11), a 2.5-mile hiking trail. Access to these trails is provided by trailheads scattered throughout the project area. Courtland Place is a popular dispersed camping area for equestrians in this prescription. Roads popular for pleasure driving are Hurricane Gap Road (FSR #31), Little Paint Creek (FSR #31B) and Paint Mountain (FSR #54).

- Two sites located in the Bald Mountain Recreation Zone north of Tennessee Highway 70, are within the 9.F Prescription (Rare Communities). The Cutshall Bog and Devils Kitchen Branch Bog rare communities provide opportunities to view flora and fauna that forest visitors might not otherwise see.

Scope of Analysis

The scope of analysis for direct and indirect effects on Recreation Resources are National Forest System lands in the Paint Creek Analysis Area (PCAA). The cumulative effects analysis will include private lands within the PCAA. The timeframe for cumulative effects is the past five years (2009-2013), and future five years (2013-2017).

Effects Analyses of the Alternatives

Alternative A (No Action)

Direct, Indirect and Cumulative Effects

Under this alternative the proposed actions would not be implemented. The overall effect would be no changes to the recreation resources. Deferring the wildlife habitat improvements could

result in fewer opportunities for hunting, fishing and wildlife viewing. There would be no cumulative effects to the recreation resource under the No Action alternative.

Alternative B (Proposed Action)

Direct and Indirect Effects

Direct effects to dispersed recreation users would primarily be from noise disturbance (e.g. chainsaws) and other activities associated with the proposed timber harvest. Commercially-harvested stands would have more of an impact on forest users due to heavy equipment use. The effects would be temporary, however, lasting until project activities were completed. The harvested areas would continue to provide dispersed recreation opportunities post-harvest.

The proposed vegetation management treatments, including the prescribed burning, would create a more open healthier forest and provide a more enjoyable experience for recreationist. The areas proposed for herbicide treatment would be visually unappealing to forest users, due to unseasonable leaf drop, brown leaves and dead stems. The impacts would be short term, usually lasting one to two growing seasons, post treatment. Evidence of timber harvest (slash, disturbed ground, etc.) and prescribed burning (blackened vegetation, scorched tree bark, etc.) may also be visually unappealing to forest users, but again, the affects would likely be evident for only one to two years, post treatment. The planting of blight resistant American chestnut, if available, could provide unique enjoyment for future recreationists.

Managing for mast-producing species, along with the proposed wildlife habitat improvements (wildlife nesting/roosting boxes, vernal ponds, and grouse drumming logs), would benefit wildlife, and may increase use of the area by birders, photographers, hunters, and others.

The proposed pre-haul maintenance of 11.4 miles of existing roads would improve conditions for people driving for pleasure and equestrians using the roads. Reconstructing the 0.1-mile section of Hurricane Gap Road would benefit dispersed recreationists, especially equestrians using Courtland Place, by removing a safety hazard to motor vehicles.

Decommissioning 3.7 miles of road, both authorized and unauthorized, would reduce access for forest users, resulting in an adverse impact for recreationists. Closing FSR 422 and 422B (approximately 2.0 miles total) would eliminate an area 4-wheel drive vehicles use to "challenge their vehicles", and would decrease off-road driving and illegal ATV and UTV use of the road. Though an adverse impact on these forest users, the roads are in extremely poor condition, and are causing resource damage, e.g. erosion.

The roads proposed to be authorized are existing non-system roads. The addition of OR-13, OR-21 and OR-23 to the Forest Service travel system would allow legal access to already-used dispersed recreation areas.

The 0.3 miles of temporary road construction would have negligible effects on recreationists. It would provide a short lived opportunity for easier access into the interior of the forest for hunters, nature watchers and photographers. The road would be closed and rehabilitated post

harvest, limiting its use to foot traffic. Eventually, the road's footprint would be reclaimed by the forest, further limiting its use by recreationists.

Restoration work in Allen Gap Pond would have negligible effects overall on forest recreationists, but would benefit nature watchers and photographers interested in wetland habitats. The proposed treatments, primarily noise disturbance from proposed thinning, could impact hikers along the AT, located approximately 300 feet from the wetland. Any effects would be temporary, lasting until project activities were completed.

Cumulative Effects

When considered with past, present and future vegetation management, Alternative B would have a cumulative effect on recreation resources. The alternative's proposed vegetation treatments, prescribed burn, and herbicide use combined with 33 acres prescribed burned in 2009 and the proposed 1,818 acre Bellcow Mountain prescribed burn (2014-2015) would affect approximately 35% of the cumulative effects analysis area. However, the proposed treatments would be implemented over several years, with the affects dispersed across time and distributed on the landscape. This would reduce the potential for recreationists to encounter large blocks of treated areas, other than the prescribed burn blocks, within any one year. Creating a more open and healthier forest within the analysis area would have a beneficial cumulative effect on recreation resources over the long term.

Annual road maintenance (prior and future) combined with the proposed prehaul road maintenance, road reconstruction and the authorization of existing roads would improve the Forest Service travel system; benefitting recreationists using the area.

Alternative C

Direct and Indirect Effects

Alternative C proposes fewer acres of early successional forest habitat created and crop tree and midstory treatments than Alternative B, but would increase thinning acres. The direct and indirect effects of Alternative C's proposed vegetation management treatments on recreation resources would be similar to those discussed in Alternative B.

Despite the increase in thinning acres, the total acres of herbicide treatments proposed under Alternative C would be slightly less than in Alternative B: 615 acres vs. 626 acres, respectively. However, the use of herbicides under Alternative C would be more evident on the land, and more visually unappealing to forest users (unseasonable leaf drop, brown leaves and dead stems) due to the treatments proposed in the Devils Kitchen area (not found in Alternative B). The impacts would be short term, however, usually lasting one to two growing seasons, post treatment.

Wildlife improvements would be the same as those in Alternative B: placement of wildlife boxes, construction of vernal ponds, and providing grouse drumming logs. Wildlife species, drawn to these constructed features, would provide a positive long-term effect on recreation opportunities such as wildlife viewing, fishing and hunting.

The miles of proposed pre-haul road maintenance would increase under Alternative C from 11.4 miles to 17.1 miles. This would result in more road being improved, a greater benefit for people driving for pleasure and equestrians using the area. Reconstructing the 0.1-mile section of Hurricane Gap Road would benefit dispersed recreationists, especially equestrians using Courtland Place, by removing a safety hazard to motor vehicles. Relocating approximately 1.0 miles of FSR 93 would eliminate the road that now bisects the Cutshall Bog rare community. The new road would be a much better access for forest users.

The 0.3 miles of temporary road construction proposed would increase access into the interior of the forest for hunters, nature watchers and photographers. After the road was closed and rehabilitated post harvest, its use would be limited primarily to foot traffic. Eventually, the road's footprint would be reclaimed by the forest, further limiting their use by recreationists.

Decommissioning 4.7 miles of road, both authorized and unauthorized roads, would limit some access for forest users, resulting in an adverse impact for recreationists. Decommissioning the approximately 0.3-mile section of FSR 93 that bisects Cutshall Bog, however, would remove sedimentation of the wetland, improving the wetland. Closing FSR 422 and 422B (approximately 2.0 miles total) would eliminate an area 4-wheel drive vehicles use to "challenge their vehicles", and would decrease off-road driving and illegal ATV and UTV use of the road. Though an adverse impact on these forest users, the roads are in extremely poor condition, and are causing resource damage, e.g. erosion.

The roads proposed to be authorized are existing non-system roads. The addition of OR-13, OR-21 and OR-23 to the Forest Service travel system would benefit recreationists by allowing legal access to already-used dispersed recreation areas.

Effects on forest users from the proposed restoration work in Allen Gap Pond would be the same as that discussed in Alternative B. The proposed restoration work in Cutshall Bog rare community would have negligible effects on forest recreationists, but would benefit nature watchers and photographers interested in bog habitats.

Cumulative Effects

The cumulative effects on recreation resources from Alternative C would be similar to those discussed in Alternative B. The vegetation treatments, including prescribed burning, proposed in Alternative C plus the past and future prescribed burns would affect approximately 31% of the analysis area, 4% less than Alternative B. The decrease would mean a forest user would be less likely to encounter a treated area in any one year than in Alternative B.

Alternative D

Direct and Indirect Effects

The proposed vegetation treatments under Alternative D are similar to those in Alternative B except for the addition of 103 acres of Group Selection. Group selection would not include pre- and post-harvest site preparation, otherwise it would have similar effects as the thinning

treatments. Approximately 513 acres of midstory treatments are proposed under Alternative D; 418 acres more than Alternative B, and 429 acres more than Alternative C. The resulting increase in herbicide treatments would be more evident on the land, and more visually unappealing to forest users. However, the impact would still be short term, usually lasting one to two growing seasons post treatment. The end result, a more open and healthier forest, would be a more enjoyable experience for recreationists over the long term.

Alternative D proposes 16.2 miles of pre-haul road maintenance, nearly five miles more than Alternative B (11.4 miles total). The impacts on dispersed recreationists would be the same as those discussed in Alternative B, only over a greater area.

The 0.3 miles of temporary road construction proposed in Alternative D is the same as and would have similar effects as those discussed in Alternatives B and C.

Alternative D proposes decommissioning 4.7 miles of road, both authorized and unauthorized, reconstructing 0.1 miles of road, and closing FSR 422 and 422B, the same as Alternative C, and would have the same effects on recreation as those discussed in Alternative C. The roads proposed to be authorized and the effects would be the same as those in Alternative C.

Relocating approximately 1.0 miles of FSR 93 would have the same effects as those discussed in Alternative C.

The effects from the restoration work in Allen Gap Pond and Cutshall Bog proposed under Alternative D would be the same as that discussed in Alternative C. Alternative D includes restoration work on nine acres of the Devils Kitchen Branch Bog rare community and two acres of the Rough Branch Beaver Pond. The effects of the additional 11 acres of restoration work would be the same as that discussed for Cutshall Bog in Alternative C.

Cumulative Effects

The cumulative effects on recreation resources from Alternative D would be similar to those discussed in Alternative B. The vegetation treatments, including prescribed burning, proposed in Alternative D plus the past and future prescribed burns would affect approximately 41% of the analysis area, 6% more than Alternative B and 10% more than Alternative C. The increase would mean a forest user would be more likely to encounter a treated area in any one year than in Alternative B or C.

Climate Change

Affected Environment

Climate change can affect the resources in the project area and the proposed project can affect climate change through altering the carbon cycle. Climate models are continuing to be developed and refined, but the two principal models found to best simulate future climate changed conditions for the various regions across the country are the Hadley Centre model and the Canadian Climate Centre model (U.S. Global Change Research Program, 2001). Both models indicate warming in the southern region of the United States. However, the models differ in that

one predicts little change in precipitation until 2030 followed by much drier conditions over the next 70 years. The other predicts a slight decrease in precipitation during the next 30 years followed by increased precipitation. These changes could affect forest productivity, forest pest activity, vegetation types, major weather disturbances (droughts, hurricanes), and streamflow. These effects would likely be seen across the Forest.

Scope of Analysis

The scope of this analysis for direct, indirect, and cumulative effects on climate change includes suitable acres of Forest Service lands in stands proposed for vegetation management/treatment and prescribed burning (see Chapter 2, Alternatives B, C, and D). The time frame used in this analysis is up to ten years after completion of the activities.

Effects Analyses of the Alternatives

Alternative A (No Action)

Direct and Indirect Effects

In general terms, Alternative A (No Action) would result in no change to the current trend for carbon storage or release. Forested stands are expected to be less resilient to possible climate change impacts, such as changes in productivity or insect and disease.

Alternatives B (Proposed Action), C and D

Direct and Indirect Effects

It is not expected that Alternatives B, C or D would substantially alter the effects of climate change in the project area. The regeneration in the areas to be harvested would provide more structural diversity, and establish a young, vigorous stand of timber that may be more resilient to the changes in climate. Midstory treatments utilizing herbicides, mechanical treatment methods for crop tree release, and thinning would provide opportunities to enhance the resilience health of productivity of the remaining ecosystem to withstand climate change stresses.

In general, genetic diversity provides resilience to a variety of environmental stressors (Moritz, 2002, Reed and Frankham, 2003, Reusch et al., 2005). Climate change affects biodiversity directly by altering the physical conditions to which many species are adapted. In some instances, changes in precipitation patterns may disrupt animal movements and influence recruitment and mortality rates (Inouye et al., 2000). Evidence is accumulating to indicate that species interactions and competitive responses under changing climates are complex and unexpected (Suttle, Thompsend, and Power, 2007). Although species with large geographic ranges have a wide range of physiological tolerance, species that are rare, threatened, endangered, narrowly distributed, and endemic, as well as those with limited dispersal ability, would be particularly at risk under climate change (Pounds et al., 2006) because they may not be able to adapt in situ or migrate rapidly enough to keep pace with changes in temperature (Hansen et al., 2001; Wilmking et al., 2004; Neilson et al., 2005b). A key predicted effect of climate change is the expansion of native species' ranges into biogeographic areas in which they previously could not survive (Simberloff, 2000; Dale et al., 2001). This prediction is supported

by the observed northward shift in the ranges of several species, both native and introduced, due to the reduction of cold temperature restrictions (Parmesan, 2006).

Maintenance of genetic diversity provides resilience to a variety of environmental stressors. Climate change affects biodiversity by altering the physical conditions to which many species are adapted. Range distribution for species varies.

Projected changes in temperature and precipitation suggest that southern ecosystems may shift dramatically. Depiction of the northern shift of the jet stream and consequent drying of the Southeast (Fu et al., 2006) varies among future climate scenarios, with some showing significant drying with others show increased precipitation (Bachelet et al., 2001). Even under many of the somewhat wetter future scenarios, closed-canopy forests of the Southeast may revert or, in some areas, be converted under temperature-induced drought stress (Bachelet et al., 2001; Scholze et al., 2006). Temperature induced droughts in Mountain ecosystems are expected to contribute to forest diebacks (Bugmann, Zieri, and Schumacher, 2005; Millar, Westfall, and Delaney, forthcoming).

The interactions of climate change with other stressors such as insects (Volney and Fleming, 2000; Logan, Regniere, and Powell, 2003), disease (Pounds et al., 2006) would challenge the management of ecosystem services and biodiversity conservation in NF ecosystems. Older forests can be strong carbon sinks (Stoy et al. 2006), and older trees absorb more CO2 in an elevated CO2 atmosphere, but wood production of these trees show limited or only transient response to CO2 (Korner et al. 2005). Studies of elevated CO2 on trees have been done with young trees (which show a positive growth response), but the one study on mature trees showed no growth response (Korner, et al. 2005). This is consistent with model results found in an independent study (Kirschbaum 2005). The general findings from a number of recent syntheses using data from the three American and European FACE sites (King et al. 2004; Norby et al. 2005; McCarthy et al. 2006a; Palmroth et al. 2006) show that North American forests will absorb more CO2 and might retain more carbon as atmospheric CO2 increases. In this study, thinning removed carbon from the stand (in the form of removed logs) and also resulted in substantial, but temporary, reduction in ANPP (aboveground net primary production). The reduction of ANPP by thinning lasted only one year, and its recovery was likely due to changes in the foliar mass and leaf traits. Finally, the data portrayed that there is a transient impact of thinning on ANPP, but that there is no long-term effect of thinning on aboveground carbon uptake in oak forests. Although this study focused on oak forests, the same principles and effects would apply to hemlock forests.

The alternatives would alter the carbon cycle in that it affects the carbon stock in any one of the pools. Each alternative would remove biomass which would reduce the amount of carbon stored in the treated stands. A portion of the carbon removed would remain stored for a period of time in wood products.

The increase in down, dead wood would temporarily convert stands from a carbon sink that removes more carbon from the atmosphere than it emits, to a carbon source that emits more carbon through respiration than it absorbs. These stands would remain a source of carbon to the atmosphere until carbon uptake by new trees and other vegetation exceeds the emissions from

decomposing dead organic material. The stands would likely remain a carbon source for several years, and perhaps for more than a decade, depending on the amount of dead biomass left on site, the length of time before new trees become reestablished, and their rate of growth once reestablished. As the stands continue to develop, the strength of the carbon sink would increase until peaking at an intermediate age and then gradually decline but remain positive. Similarly, once new trees are established, carbon stocks would accumulate rapidly for several decades. The rate of accumulation would slow as the stands age. Carbon stocks would continue to accumulate, although at a declining rate, until impacted by future disturbances.

Recent scientific literature confirms this general pattern of changes in net ecosystem productivity (NEP)[1] and carbon stocks over the period of forest stand development. Most mature and old stands remained a net sink of carbon. Pregitzer and Euskirchen (2004) synthesized results from 120 separate studies of carbon stocks and carbon fluxes for boreal, temperate, and tropical biomes. They found that in temperate forests NEP is lowest, and most variable, in young stands (0-30 years), highest in stands 31-70 years, and declines thereafter as stands age. These studies also reveal a general pattern of total carbon stocks declining after disturbance and then increasing, rapidly during intermediate years and then at a declining rate, over time until another significant disturbance (timber harvest or tree mortality resulting from drought, fire, insects, disease or other causes) kills large numbers of trees and again converts the stands to a carbon source where carbon emissions from decay of dead biomass exceeds that amount of carbon removed from the atmosphere by photosynthesis within the stand.

The impacts of the action alternatives on global carbon sequestration and atmospheric concentrations of CO_2 are miniscule. However, the forests of the United States significantly reduce atmospheric concentrations of CO_2 resulting from fossil fuel emissions. The forest and wood products of the United States currently sequester approximately 200 teragrams[2] of carbon per year (Heath and Smith, 2004). This rate of carbon sequestration offsets approximately 10% of CO_2 emissions from burning fossil fuels (Birdsey et al., 2006). U.S. Forests currently contain 66,600 teragrams of carbon. The short-term reduction in carbon stocks and sequestration rates resulting from the proposed project are imperceptibly small on global and national scales, as are the potential long-term benefits in terms of carbon storage.

The currently large carbon sink in US forests is a result of past land use changes, including the re-growth of forests on large areas of the eastern U.S. harvest in the 19th century, and 20th century fire suppression in the western U.S. (Birdsey et al. 2006). The continuation of this large carbon sink is uncertain because some of the processes promoting the current sink are likely to decline and projected increases in disturbance rates such as fire and large-scale insect mortality may release a significant fraction of existing carbon stocks (Pacala et al. 2008; Canadell et al. 2007). Management actions – such as those proposed – that improve the resilience of forest to climate-induced increases in frequency, and utilize harvested trees for long-lived forest products

[1] Net ecosystem productivity, or NEP, is defined as gross primary productivity (GPP) minus ecosystem respiration (ER) (Chapin et al. 2006). It reflects the balance between (1) absorbing CO_2 from the atmosphere through photosynthesis (GPP) and (2) the release of carbon into the atmosphere through respiration by live plants, decomposition of dead organic matter, and burning of biomass (ER). When NEP is positive, carbon accumulates in biomass. Ecosystems with a positive NEP are referred to as a carbon sink. When NEP is negative, ecosystems emit more carbon than they absorb. Ecosystems with a negative NEP are referred to as a carbon source.

[2] 200 teragrams, or Tg, equals 196,841,306 US tons.

and renewable energy sources may help sustain the current strength of the carbon sink in US forests (Birdsey et al. 2007).

Prescribed Burning

Burning in forests incites concerns about global climate changes; climate change may be exacerbated by forest fires if allowed to burn frequently and out of control over large areas. Climate change may occur in part because the burned forest areas are no longer sequestering carbon dioxide at the same rate as pre-fire, and carbon stocks that had been stored within the biomass of the forest are released into the atmosphere. However, unlike large wildfires, prescribed burns are generally only low- to moderate-intensity and cover only small areas at a time. They do not result in large-scale tree death, as wildfires sometimes do. On the contrary, research indicates that regular, periodic prescribed burning results in a reduction of risk of catastrophic wildfire occurrence. The short-term loss of biomass resulting from a fire may be offset by the burned area's increased ability to produce herbaceous biomass. Additionally, mature forests sequester carbon at a lower rate than younger forests, and therefore management activities such as prescribed fire that maintain a variety of forest ages may increase the ability of forest tracts to sequester carbon. Management actions (such as prescribed burning) that improve the resilience of forests to climate-induced disturbances such as catastrophic wildfire may help sustain the current strength of the carbon sequestration ability of U.S. forests. Finally, at a global or national scale, the short-term reduction in carbon stocks and sequestration rates of the proposed burn project are imperceptibly small, as are the potential long-term benefits.

Cumulative Effects for All Alternatives

For all alternatives, the release of stored carbon may be an obvious concern; the contribution of the proposed project areas to the carbon cycle would be extremely small. When combined, the carbon from the project would have minimal cumulative effects not only at the local level, but at the larger level. When implemented, the risk and rate of additional carbon release through regeneration would be minimal for the reasonably foreseeable future.

Cultural Resources

Affected Environment

Cultural resources are the non-renewable, physical remains of prehistoric and historical human activities. They are subject to damage or destruction from land disturbing activities, including those associated with vegetation manipulation and road construction. Area disturbance can damage or destroy the historical, cultural, or scientific integrity of historical or prehistoric resources. Disturbance of historical sites, such as old cabins, can reduce the ability to reconstruct the recent history of settlement in the local area. Disturbance of ethnographic sites, such as traditional Native American campsites or burial grounds, can reduce the interpretive significance of the site or can infringe on religious rites.

Current CNF direction is to protect significant cultural resources from adverse impacts that may occur from land disturbing activities, and to inventory NFS lands in order to locate and evaluate all cultural resources. This policy is based on adherence to Federal and state laws and regulations. Cultural resources are closely coordinated with the State Historic Preservation

Officer (SHPO). In compliance with Executive Order 11593, the National Historic Preservation Act, NEPA, and FS regulations (Forest Service Manual 2360), a cultural resource inventory was performed to determine if potentially significant cultural resources would be affected.

Scope of Analysis

The scope of analysis is the individual boundaries of the areas identified in each of the alternatives. The time frame is from if and when the project is implemented to the time of completion.

Effects Analyses of the Alternatives

Alternative A (No Action)

Direct, Indirect and Cumulative Effects

This alternative would have no effect on cultural resources. There is limited potential for discovery of currently unknown sites. There would be no known cumulative effects.

Alternatives B (Proposed Action), C and D

Direct, Indirect and Cumulative Effects

Alternatives B, C and D would not affect cultural resources as long as site(s) that have potential eligibility for inclusion in the National Register of Historic Places (NRHP) would be avoided during project implementation. Forest Service Heritage Resource records document that all areas of proposed ground disturbance (timber sale, etc.) have been previously surveyed on multiple previous occasions for cultural resources. No significant cultural resource sites were documented in any of these previous field surveys or in research of the historic records for these survey areas. If cultural resources were to be discovered during project implementation, the project would be halted until the resource(s) is/are evaluated. There would be no known cumulative effects.

Economics

Affected Environment

An analysis of the economic efficiency of the alternatives was conducted in order to provide a reliable means to contrast the relative costs and benefits of the proposed activities. The analysis provides the Responsible Official with the assurance that economic efficiency was considered. It also provides some information about the potential economic impacts of the alternatives.

Cost and unit estimations were derived from field data, maps, and actual prices from similar projects. The values of timber products were derived from current market data, which are exceptionally low at this time. The economic analysis only looked at stumpage-related benefits and the costs involved in preparing and implementing a timber sale. Timber harvesting activities may result in changes, both positive and negative, to other resources such as wildlife or recreation. These changes can have an associated economic value, but they are difficult to quantify in amount or value, and are therefore not considered in this analysis.

Scope of Analysis

The scope of analysis is generally the communities within about one hundred miles of the project area. The time frame is generally from when the project is first implemented through the completion of reforestation, which is generally three years. Only the net present value of the commercial timber sale is discussed.

Effects Analyses of the Alternatives

Alternative A (No Action)

Direct and Indirect Effects

Alternative A would not provide any additional economic benefits, beyond what is occurring now, to help provide employment and generate revenues in this portion of eastern Tennessee. There would be no revenues or associated costs of a commercial timber sale with Alternative A.

Cumulative Effects

The No Action Alternative would have no cumulative effects on the local economy.

Alternative B (Proposed Action)

Direct and Indirect Effects

Forest Service Manual 2432.22c requires a financial analysis of any timber sale of $100,000 or more, to inform how expected revenues would cover expected costs. This alternative would produce approximately 10,568 hundred cubic feet (CCF) of forest products. Alternative B would provide an economically efficient timber harvest, benefiting the local economy, providing jobs and payments to local and federal governments. The alternative would also provide high quality sawtimber and pulpwood. The discounted cash flow analysis shows a positive Present Net Value of $121,110 (Table 3zz).

Table 3zz[1]: Benefits to Cost Ratio

Revenues and Costs	Alternative A	Alternative B	Alternative C	Alternative D
Revenues				
Timber	$0	$582,503	$617,197	$602,003
Recreation	0	0	0	0
Wildlife	0	0	0	0
Other	0	0	0	0
Total Present Revenues	**0**	**$582,503**	**$617,197**	**$602,003**
Costs				
Harvest Administration	$0	$105,680	$118,400	$108,560
Sale prep	0	264,200	296,000	271,400
Roads	0	46,621	79,506	77,345
Reforestation	0	42,456	48,556	44,408
Silvicultural Exams	0	2,436	2786	2548
Timber Stand Improvement	0	0	0	0
Total Present Costs	**0**	**$461,393**	**$545,248**	**$504,261**
Present Net Value	**0**	**$121,110**	**$71,949**	**$97,742**

[1] This table follows direction given in Forest Service Handbook (FSH) 2409.18,30. Some calculations used to arrive at the values in the table were derived using a computer spreadsheet (Project File).

Alternative C

Direct and Indirect Effects

Alternative C would produce approximately 11% more forest products (11,840 CCF) compared to Alternative B, and would provide an economically efficient timber harvest, benefiting the local economy. This alternative would provide a positive impact on the local economy by providing some sawtimber and pulpwood. The discounted cash flow analysis shows a positive Present Net Value of $71,949 (Table 3zz).

Alternative D

Direct and Indirect Effects

Alternative would produce approximately 3% more forest products (10,856 CCF) compared to Alternative B, and would provide an economically efficient timber harvest, benefiting the local economy. This alternative would provide a positive impact on the local economy by providing some sawtimber and pulpwood. The discounted cash flow analysis shows a positive Present Net Value of $97,742 (Table 3zz).

Cumulative Effects for Alternatives B, C and D

The beneficial effects of previous timber sales on the local economy would have generally been exhausted by the time of implementation, and no additional sales are expected from this area in

the near future. There would be no cumulative effects with implementation of these alternatives.

Chapter 4: References Cited

Adams, T and D. Hook. 1993. Implementation and Effectiveness Monitoring of Forestry Best Management Practices on Harvested Sites in South Carolina. South Carolina Forestry Commission. Columbia, South Carolina.

Adams, T. 1994. Implementation Monitoring of Forestry Best Management Practices on Harvested Sites in South Carolina with emphasis on BMP compliance in the Blue Ridge Mountains. South Carolina Forestry Commission. Columbia, South Carolina.

Anderson C. and B. Lockaby. 2011. The Effectiveness of Forestry Best Management Practices for Sediment Control in the Southeastern United States: A Literature Review. Southern Journal of Applied Forestry. 35 (4)

Artman, V.L., E.K Sutherland, and J.F. Downhower. 2001. Prescribed Burning to Restore Mixed-Oak Communities in Southern Ohio: Effects on Breeding-Bird Populations. Conservation Biology: Vol. 15, No. 5 (Oct., 2001) (pp. 1423-1434). Website accessed: http://www.jstor.org/stable/info/3061498.

Ash, A.N. 1997. Disappearance and return of Plethodontid salamanders to clear-cut plots in the southern Blue Ridge Mountains. Conservation Biology 11(4):983-989.

Biebighauser, T. R. 2003. A Guide to Creating Vernal Ponds. USDA Forest Service. pp. 3-4.

Birdsey, R.; Jenkins, J.; Johnston, M.; Huber-Sannwald, E. 2007. North American Forests. *In* King, A.W.; Dilling, L.; Zimmerman, G.P.; Fairman, D.M.; Houghton, R.A.; Marland, G.; Rose, A.Z.; Wilbanks, T.J.; eds. The First State of the Carbon Cycle Report (SOCCR): The North American carbon budget and implications for the global carbon cycle, a report by the US Climate Change Science Program and the Subcommittee on Global Change Research, National Oceanic and Atmospheric Administration, Asheville, NC; National Climatic Data Center: 117-126.

Birdsey, R., K. Pregitzer and A. Lucier. 2006. Forest Carbon Management in the United States: 1600-2100. J. Environ. Qual. 35:1461–1469.

Buchwalter, D. et al. 1996. Fact Sheet for Imazapyr and Forestry Use. Agricultural Chemistry Research and Extension Department. Oregon State University.

Bull, Evelyn L., Abe A. Clark, and Jay F. Shepherd. 2005. Short-term Effects of Fuel Reduction on Pileated Woodpeckers in Northeastern Oregon – A Pilot Study. USDA Forest Service, Pacific Northwest Research Station. Research Paper PNW-RP-564.

Bull, Evelyn L. and Jerome A. Jackson. 1995. Pileated Woodpecker (Dryocopus pileatus), The Birds of North America Online (A. Poole, Ed.). Ithaca: Cornell Lab of Ornithology; Retrieved from the Birds of North America Online: http://bna.birds.cornell.edu/bna/species/148.

Burch, J.B. and T.A. Pearce. 1990. Terrestrial Gastropoda. *In*: Dindal Daniel L. (ed.), Soil biology guide. pp. 201-204.

Canadell, J.G., D.E. Pataki, R. Gifford, R.A. Houghton, Y. Luo, M.R. Raupach, P. Smith, W. Steffen. 2007. Saturation of the Terrestrial Carbon Sink. *In* Candadell JG, Pataki D, Pitelka L (eds) Terrestrial Ecosystems in a Changing World. The IGBP Series, Springer-Verlag, Berlin Heidelberg, pp. 59-78.

Carter, Marcia S. 2013. Biological Assessment for Paint Creek Project. August 22, 2013.

Carter, Marcia S and J.H. McGuiness. 2013. Biological Evaluation for Activities Related to Wildlife Habitat, Forest Management, and Roads: Paint Creek Project. September 2, 2013.

Chapin, F.S.; Woodwell, G.M.; Randerson, J.T.; Rastetter, E.B.; Lovett, G.M.; Baldocchi, D.D.; Clark, D.A.; Harmon, M.E.; Schimel, D.S.; Valentini, R.; Wirth, C.; Aber, J.D.; Cole, J.J.; Goulden, M.L.; Harden, J.W.; Heimann, M.; Howarth, R.W.; Matson, P.A.; McGuire, A.D.; Melillo, J.M.; Mooney, H.A.; Neff, J.C.; Houghton, R.A.; Pace, M.L.; Ryan, M.G.; Running, S.W.; Sala, O.E.; Schlesinger, W.H.; Schulze, E.-D. 2006. Reconciling Carbon-cycle Concepts, Terminology, and Methods. Ecosystems 9: 1041-1050.

Cherokee National Forest Landscape Restoration Initiative. 2012. Steering Committee Recommendations to the Forest Service for the North Zone (Watauga and Unaka Districts) of the Cherokee National Forest. pp. 56. Available at: *www.communityplan.net/cherokee*.

Cherokee National Forest. 2004a. Appendices, Final Environmental Impact Statement for the Revised Land and Resource Management Plan. pp.274-303, 332-340.

Cherokee National Forest. 2004b. Final Environmental Impact Statement for the Revised Land and Resource Management Plan. pp.65, 198-199.

Dissmeyer, G. E.; Stump, R. F. 1978. Predicted Erosion Rates for Forest Management Activities in the Southeast. U. S. Department of Agriculture. Forest Service. State and Private Forestry, Southeastern Area. Atlanta GA. 39 pages.

Douglas, James, and Swank, Wayne. 1972. Streamflow Modification Through Management of Eastern Forests. Southeast Forest Exp. Station, USDA Forest Service Research Paper SE-94, 15 pp.

Elliot, Katherine J. and James M. Vose. 2006. Fire effects on water quality: A synthesis of response regulating factors among contrasting ecosystems. USDA SRS Coweeta Hydrologic Laboratory. Second Interagency Conference on Research in the Watersheds. Available: http://coweeta.uga.edu/publications/3058.pdf.

Elliot, Katherine J. and James M. Vose. 2005. Initial effects of prescribed fire on quality of soil solution and stream water in the Southern Appalachian Mountains. South. J. Appl. For. 29(1):5-15. Available: http://www.srs.fs.usda.gov/pubs/9444.

Federal Emergency Management Agency, DFIRM Flood Mapping (https://hazards.fema.gov/wps/portal/mapviewer) [Accessed June 11, 2012]

Filipek, S.P. 1993. Timber Harvest. Impacts on Warmwater Streams: Guidelines for Evaluation: 227-239.

Flora of North America Editorial Committee. 2002. Flora of North America. Oxford University Press. New York, New York. FNA Vol. 23, p 448.

Hardeman, W.D., and others, 1966, Geologic map of Tennessee: Division of Geology, TN Department of Environment and Conservation, scale 1:250,000 (Geology available at Tennessee Spatial Data Server at http://www.tngis.org/geology.html)

Heath, L.S. and J.E. Smith, 2004. Criterion 5, Indicator 26: Total forest ecosystem biomass and carbon pool, and if appropriate, by forest type, age class and successional change. *In*: Data Report: A Supplement to the National Report on Sustainable Forests, 2003 [Darr, D.R. (coord.)]. FS-766A, U.S. Dept. of Agriculture, Wash. DC, 14 pp. Website: www.fs.fed.us/research/sustain/contents.htm

Mallipudi, N. M., S. J. Stout, A. R. daCunha, and A. Lee. 1991. Photolysis of imazapyr (AC 243997) herbicide in aqueous media. J. Agric. Food Chem. 39(2):412-417.

Maxwell, J.R. and Neary, D.G. 1991. Vegetation management effects on sediment yields. pp. 12-55 to 12-63, *In*: T. Shou-Shou and K. Yung-Huang (eds.) Proceedings of the 5th Federal Interagency Sediment Conference, Vol. 2. March 18-21, 1991, Las Vegas, NV, Federal Energy Regulatory Commission, Washington, D.C.

McGuiness, J.H. 2013. Paint Creek Rare Plant Analysis by Survey Site.

Meyer, Rachelle. 2006. Limnothlypis swainsonii. In: Fire Effects Information System, [Online]. U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory (Producer). Available: http://www.fs.fed.us/database/feis/ [2013, September 1].

Miller, J.H., Chambliss, E. B., and N. J. Lowenstein. 2010. A Field Guide for the Identification of Invasive Plants in Southern Forests. USDA Forest Service, Southern Research Station. General Technical Report SRS-119. p.1.

Miller, E.L., Beasley R. S., and Lawson, E.R., 1986a. Stormflow, Sedimentation, and Water Quality Responses Following Silvicultural Treatments in the Ouachita Mountains. In: Blackmon, B.G., ed. Forestry and water quality: a mid-South symposium. Little Rock, AR: University of Arkansas, Cooperative Extension Service: 117-129.

Mowbray, Thomas B. 1999. Scarlet Tanager (Piranga olivacea), The Birds of North America Online (A. Poole, Ed.). Ithaca: Cornell Lab of Ornithology; Retrieved from the Birds of North America Online: http://bna.birds.cornell.edu/bna/species/479.

National Wetlands Inventory. 2013. http://www.fws.gov/wetlands/index.html. [Accessed April 6, 2013].

Natural Resources Conservation Service (NRCS). 2013a. Temperature and Precipitation Summary (TAPS) for Carter County, Tennessee. http://www.wcc.nrcs.usda.gov/climate/foguide.html#taps. [Accessed 4/6/2013]

Natural Resources Conservation Service. 2013b. U.S. General Soil Map (STATSGO2). Available online at http://soildatamart.nrcs.usda.gov. [Accessed April 6, 2013]

NatureServe. 2012. NatureServe Explorer: An online encyclopedia of life [web application]. Version 7.1. NatureServe, Arlington, Virginia. Available http://www.natureserve.org/explorer.

Neary, D.G. and J.L. Michael. 1996. Herbicides - protecting long-term sustainability and water quality in forest ecosystems. New Zealand Journal of Forestry Science 26:241-264.

Nicholson, C.P. 1997. Atlas of the Breeding Birds of Tennessee. University of Tennessee Press, Knoxville.

Ogden, L. J. and B. J. Stutchbury. 1994. Hooded Warbler (*Wilsonia citrina*), The Birds of North America Online (A. Poole, Ed.). Ithaca: Cornell Lab of Ornithology; Retrieved from the Birds of North America Online: http://bna.birds.cornell.edu/bna/species/110.

O'Keefe, Joy. 2011. Assistant Professor, Department of Biology, Indiana State University, pers. comm. October 11, 2011.

Pacala, R.; Birdsey, R.A.; Bridgham, S.D.; Conant, R.T.; Davis, K.; Hales, B.; Houghton, R.A.; Jenkins, J.C.; Johnston, M.; Marland, G.; Paustian, K. 2007. The North American carbon budget past and present. In King, A.W.; Dilling, L.; Zimmerman, G.P.; Fairman, D.M.; Houghton, R.A.; Marland, G.; Rose, A.Z.; Wilbanks, T.J.; eds. The First State of the Carbon Cycle Report (SOCCR): The North American carbon budget and implications for the global carbon cycle, a report by the US Climate Change Science Program and the Subcommittee on Global Change Research, National Oceanic and Atmospheric Administration, Asheville, NC; National Climatic Data Center: 117-126.

Patric, J.H. October, 1976. Soil Erosion in the Eastern Forest. Journal of Forestry. pp 671-677.

Pregitzer, K.S. and Euskirchen, E.S. 2004. Carbon cycling and storage in world forests: biome patterns related to forest age. Global Change Biology 10: 2052-2077.

Reid. L.M., and T. Dunne. 1984. Sediment production from forest road surfaces. Water Resources Research 20; 1753-1761.

Richardson, Michael and Daniel W. Brauning. 1995. Chestnut-sided Warbler (*Dendroica pensylvanica*), The Birds of North America Online (A. Poole, Ed.). Ithaca: Cornell Lab of Ornithology; Retrieved from the Birds of North America Online: http://bna.birds.cornell.edu/bna/species/190.

Riedell M. 2004. Forest Road Erosion Research at the Coweeta Hydrologic Laboratory. Proceedings of the Forest Service National Earth Sciences Conference, San Diego, Ca.

Riedel, M., Swift, L. W., Vose, J.M., and Clinton, B.D. 2004. Forest Road Erosion Research at the Coweeta Hydrologic Laboratory. Proceedings of the Forest Service National Earth Sciences Conference, San Diego, CA. 18-22 October 2004.

Rosgen, D.L. 2012. Course Book: Short Course on Applied Fluvial Geomorphology, Asheville, North Carolina, February 6-12, 2012, p. Applications 1.

Rosgen, D.L. 1996. Applied River Morphology: Second Edition. Wildland Hydrology. pp. 4-9, 5-5, and 5-6.

Royal BC Museum. 2006. Terrestrial Gastropods of the Columbia Basin, British Columbia: Distribution of Terrestrial Gastropods. Retrieved online: http://www.livinglandscapes.bc.ca/cbasin/molluscs.

Sauer, J. R., J. E. Hines, J. E. Fallon, K. L. Pardieck, D. J. Ziolkowski, Jr., and W. A. Link. 2012. *The North American Breeding Bird Survey, Results and Analysis 1966 - 2011. Version 07.03.2013 USGS Patuxent Wildlife Research Center, Laurel, MD. Retrieved Online:* http://www.mbr-pwrc.usgs.gov/bbs/bbs.html.

Sedell, J.R. 1981. Fish Habitat and Streamside Management: Past and Present. Proceedings of the Technical Session of the Effects of Forest Practices on Fish and Wildlife Production: pp 41-52.

Strange, R.J., J.W. Habera. 1995. Wild Trout Project Annual Report, 1994. University of Tennessee and Tennessee Wildlife Resources Agency.

Swank, W.T. et al. 1982. Changes in water yield and storm hydrograph following commercial clear cutting on a southern Appalachian catchment. Pp. 583-594. *In* Hydrological research basins and their use in water resource planning: Symposium proceedings. National Hydrological Service, Bern, Switzerland.

Swank, W.T., DeBano, L., and Nelson, D. 1989. Effects of Timber Management Practices on Soil and Water. Pages 79-106. From the Scientific Basis for Silvicultural and Management Decisions in National Forest System. General Technical Report WO-55.

Swank, W.T., Vose, J.M., and Elliot, K.J. 2001. Long-Term Hydrologic and Water Quality Responses Following Commercial Clear-cutting of Mixed Hardwoods on a Southern

Appalachian Catchment. Forest Ecology and Management 143, pages 163-178.

Swift, L.W.; Elliott, K.J.; Ottmar, R.D. & Vihnanek, R.E. 1993. Site preparation burning to improve southern Appalachian pine-hardwood stands: fire characteristics and soil erosion, moisture, and temperature. Canadian Journal of Forest Research 23:2242-2254

Syracuse Environmental Research Associates (SERA), Inc. 2004. Imazapyr (Arsenal, Chopper, and Stalker Formulations) Final Report. Task No. 14. SERA TR 98-21-14-01b.

Syracuse Environmental Research Associates (SERA), Inc. 2003. Glyphosate–Human Health and Ecological Risk Assessment Final Report. Task No. 9. SERA TR 02-43-09-04a.

Syracuse Environmental Research Associates (SERA), Inc. 2003. Triclopyr–Revised Human Health and Ecological Risk Assessment Final Report. Task No. 13. SERA TR 02-43-13-03b.

Tennessee Department of Agriculture, Division of Forestry (TDF). 2003. Guide to Forestry Best Management Practices.

Tennessee Department of Environment and Conservation (TDEC). 2013a. Rules of Tennessee Department of Environment and Conservation, Division of Water Pollution Control, Chapter 1200-4-4, Use Classifications for Surface Waters. Effective Date July 2, 2013. 38p. (http://www.tn.gov/sos/rules/1200/1200-04/1200-04-04.20130702.pdf, pp. 21 & 26)

Tennessee Department of Environment and Conservation. 2013b. Rules of Tennessee Department of Environment and Conservation, Tennessee Water Quality Control Board, Chapter 1200-04-03, General Water Quality Criteria. Effective Date: July 2, 2013. 45p. (http://www.tn.gov/sos/rules/1200/1200-04/1200-04-03.20130702.pdf. p.32)

Tennessee Department of Environment and Conservation. 2013c. TDEC Assessment Interactive Mapper. http://tnmap.tn.gov/wpc/default.aspx/resetSession=true. [Accessed 8/8/2013]

Tennessee Department of Environment and Conservation. 2012. Tennessee Heritage Program Rare Plant List. p. 24. Available at http://state.tn.us/environment/na/pdf/plant_list.pdf

Tennessee Department of Environment and Conservation. 2007a. Rules of Tennessee Department of Environment and Conservation, Division of Water Pollution Control, Chapter 1200-4-4, Use Classifications for Surface Waters. Effective Date October 6, 2007. 34p. (http://tn.gov/sos/ rules/1200/1200-04/1200-04-04.pdf. p.26)

Tennessee Department of Environment and Conservation. 2007b. Rules of Tennessee Department of Environment and Conservation, Tennessee Water Quality Control Board, Chapter 1200-04-03, General Water Quality Criteria. Effective Date: July 23, 2007. 43p. (http://www.tn.gov/sos/ rules/1200/1200-04/1200-04-03.20110531.pdf. p.29)

Tennessee Department of Environment and Conservation, Division of Water Pollution Control. 2000. Tennessee Ecoregion Project. December 2000. p.88.

Thomas, J. 2012. Distribution and Life History of MIS and Demand Species of the Cherokee National Forest.

Trout Unlimited. 2006. Eastern brook trout: status and threats, Tennessee and North Carolina. EBTJV (Eastern Brook Trout Joint Venture). State brochures. Arlington, Virginia. 2 p. Available online: http://www.easternbrooktrout.org/docs/brookie_TN-NC.pdf.

Tu I.M., Hurd C.C., and Randall J.M. 2001. Weed Control Methods Handbook: Tools and Techniques for Use in Natural Areas. Arlington (VA): The Nature Conservancy. (18 July 2003; http://tncweeds.ucdavis.edu/handbook.html)

USDA, Environmental Protection Agency, Inventory Of U.S. Greenhouse Gas Emissions And Sinks: 1990 – 2007, March 2008 Public Review Draft.

USDA, Forest Service. 2012. Travel Analysis Process Report, Paint Creek Watershed Assessment Area. Cherokee National Forest, Unaka Ranger District.

USDA, Forest Service. 2004a. Cherokee National Forest Revised Land and Resource Management Plan.

USDA, Forest Service 2004b. Final Environmental Impact Statement for the Cherokee National Forest Revised Land and Resource Management Plan. Cleveland, TN.

USDA, Forest Service. 1997. Guidance for Conserving and Restoring Old-Growth Forest Communities on National Forests in the Southern Region. Report of the Region 8 Old-Growth Team. Southern Region, Atlanta, GA. Forestry Report R8-FR 62. pp. 122.

USDA, Forest Service. 1995. Landscape Aesthetics: A Handbook for Scenery Management, Agriculture Handbook Number 701. pp. 104.

USDA, Forest Service. 1989. (VMEIS) Vegetation Management in the Appalachian Mountains, Final Environmental Impact Statement. Atlanta, GA: U.S. Department of Agriculture, Forest Service, Southern Region. Vol. II Appendices Pages 3-5, Volume II Appendices Supplement 1, pages 1-10.

U.S. Global Change Research Program, National Assessment Synthesis Team. 2001. *Climate change impacts on the United States – the potential consequences of climate variability and change*. United Kingdom: Cambridge University Press, 612 pp.

Van Horn, M. A. and T.M. Donovan. 1994. Ovenbird (*Seiurus aurocapilla*), The Birds of North America Online (A. Poole, Ed.). Ithaca: Cornell Lab of Ornithology; Retrieved from the Birds of North America Online: http://bna.birds.cornell.edu/bna/species/088.

Whitaker Jr., J.O. and W.J. Hamilton, Jr. 1998. Mammals of the Eastern United States. Cornell University Press. Ithaca , NY.

Yoest, C., C. Hunter, and J. Sweaney. 2012. Big Game Harvest Report, 2011-2012, Tennessee. Tennessee Wildlife Resources Agency. Technical Report 12-09. Retrieved online: http://www.tn.gov/twra/pdfs/biggamereport.pdf.

Chapter 5: List of Preparers

Team Leader

Jonathan Lampley (NEPA Planner): (Reassigned May 2015)

Team Members

Marcia Carter (Fisheries Biologist): Terrestrial/Aquatic Fauna, TES, MIS, Demand, Rare Species

Alice Cohen (NRTPM): Recreation

Matt Fusco (Landscape Architect): Scenery Resources

Jeff Kincaid (Forester): Forest Resources

Joe McGuiness (Wildlife Biologist): Terrestrial Flora, TES, MIS, Rare Species

Stephanie Medlin (Forest NEPA Coordinator): NEPA, Climate Change

Allison Reddington (Forest Hydrologist): Soil and Water

Thomas Scott (Fisheries Biologist): Aquatics

Jim Stelick (Vegetation Management Program Mgr.): Vegetation Mgt, Pesticide Use, Economics

Chris Stoehrel (Botanist): Terrestrial Flora

Gary Watson (Engineering Technician): Transportation System, Roads